

Two patients with continued nonunion after the use of iliac bone as a graft had sequestration of the cancellous chips implanted about the site of the nonunion and developed a draining sinus. On the removal of the nonviable implant the drainage stopped and the wound healed without further complication. These cases are not considered as being osteomyelitis but as being foreign body reactions. In any event they contributed to the continued nonunion of the fracture being treated.

The anterior iliac crest is a generous source and in view of the fact that frequently all of the bone is not used, an opportunity to keep the bone bank well stocked with good bone is provided.

#### CONCLUSIONS

The iliac bone furnishes a readily available source of cancellous bone for use as graft. Securing the bone graft from the anterior crest of the ilium is technically easier, provides more bone without complication, and results in less loss of blood and less residual pain than when the posterior crest of the ilium is resected. Under ordinary circumstances the cancellous bone secured from the ilium is readily incorporated in the recipient site. An interval of at least 1 year should be allowed before bone grafting is attempted in an area formerly the site of osteomyelitis. Despite the use of antibiotics the implantation of a bone graft in the face of infection is useless and dangerous.



# Fabrication of a Porcelain Jacket Crown

FRANCIS W. SHAFER, *Captain, DC, U S A.*<sup>1</sup>

**I**N AN effort to simplify the fabrication of a porcelain jacket crown the following procedure is recommended. A Steele's facing (Army-Navy Catalog of Medical Matériel Item No. 5-605-250) is used and a porcelain lingual baked onto it. Porcelain for the lingual made by the manufacturer of the facing porcelain should be selected in order to get a homogeneous fusing of the two porcelains. The Steele's facing is ground out on the lingual surface, and adapted to the platinum covered prepared tooth. This hollowed-out facing is luted into position with sticky wax, from the lingual surface, to the 0.001-inch platinum cap covering the amalgam die of the prepared tooth. The stone model with the die in place, as well as the placed facing, is well lubricated with liquid petrolatum, and a stone matrix or splint is placed on the labial area. After the stone matrix has hardened it is removed, then the wax is removed from the porcelain facing and platinum cap. By placing the facing in the stone matrix, and the matrix on the stone model, damp porcelain can be vibrated onto the lingual surface of the platinum cap, and built up to the desired form. The unprocessed crown is removed and given a low biscuit bake. Two or three successive bakes are then made and a professional looking jacket crown will result.

By the use of this short-cut an excellent crown can be made that will give an esthetic, well-fitting, all porcelain jacket crown.

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# Demerol, Scopolamine, and Caudal Analgesia<sup>1</sup>

## Results in 700 Cases

WILLIAM W. MANSON, *CHIEF, GEORGE F. GEISINGER CLINIC, U. S. N.*

EVER since Edwards and Hingson's article<sup>2</sup> on their use of continuous caudal analgesia appeared in 1942, the literature has contained numerous reports on this method of relief of pain during labor. Many of these reports<sup>3-7</sup> have favored this procedure but as evidence of its decreasing popularity, the 1947 Year Book of Obstetrics and Gynecology<sup>8</sup> failed to report on a single article dealing with caudal analgesia. In 1945 Nicodemus, Rittmiller, and Ladden<sup>9</sup> reported their experience with continuous caudal analgesia in obstetrics at a group clinic staffed by full-time obstetricians. They concluded that labors were longer, uterine contractions were of less intensity, the expulsive forces of the abdominal muscles were lost, occiput posterior positions rotated less often, and operative deliveries were increased. Since that time, in an effort to correct these faults of caudal analgesia, the following method of the management of labor has been evolved at the George F. Geisinger clinic with the following results in 700 consecutive vaginal deliveries during the period from 1 July 1948 to 15 March 1949.

<sup>1</sup>Department of Obstetrics, George F. Geisinger Memorial Hospital, Danville, Pa.

<sup>2</sup>EDWARDS, W. R., and HINGSON, R. A.: Continuous caudal analgesia in obstetrics. *Am. J. Surg.* 57: 459-461, Sept. 1942.

<sup>3</sup>HINGSON, R. A., and EDWARDS, W. R.: Continuous caudal analgesia in obstetrics. *J. A. M. A.* 121: 225-229, Jan. 23, 1947.

<sup>4</sup>HINGSON, R. A.; EDWARDS, W. R.; LILL, C. R., et al.: New born mortality and morbidity with continuous caudal analgesia: analysis of cases in New York City, 1943-1944, and Memphis, with controls. *J. A. M. A.* 134: 221-229, Jan. 23, 1948.

<sup>5</sup>HINGSON, W. R.: Continuous caudal analgesia in obstetrics: 700 cases. *J. A. M. A.* 121: 326-341, June 3, 1944.

<sup>6</sup>LILL, C. R.: The present status of continuous caudal and spinal analgesia in obstetrics. *M. Clin. North America* 32: 1687-1697, Nov. 1948.

<sup>7</sup>MARTIN, W. H.: Continuous caudal analgesia: a report of 1300 consecutive cases. *Am. J. Obst. & Gynec.* 54: 756-761, Oct. 1948.

<sup>8</sup>GREENHILL, J. P. (editor): The 1947 Year Book of Obstetrics and Gynecology. The Year Book Publishers, Inc., Chicago, Ill., 1948. pp. 141-142.

<sup>9</sup>NICODEMUS, R. E.; RITTMILLER, L. F.; and LADDEN, L. J.: Continuous caudal analgesia in obstetrics on trial. *Am. J. Obst. & Gynec.* 54: 512-518, Sept. 1945.



## MANAGEMENT OF LABOR

When labor had become definitely established, as evidenced by the quality and frequency of the uterine contractions and the progressive dilatation and effacement of the cervix, the patient received an initial dose of 100 mg. of demerol and 0.6 mg. of scopolamine. The timing of this initial dose depended on the stoicism and the pain threshold of the individual patient. Generally, primiparas received this medication when their pains were of good quality, occurred as often as every 3 minutes, and the cervix was dilated 4 cm. The timing of the administration of demerol and scopolamine to multiparas depended on parity, history of rapidity of previous labors, strength and frequency of labor pains, dilatability of the cervix, and, above all, the experience and clinical judgment of the attending obstetrician. In both primiparas and multiparas, if labor was still active 1 hour after the administration of the first analgesic, 100 mg. of demerol were given and repeated thereafter at 1- to 2-hour intervals, depending on the progress of labor. Scopolamine was seldom repeated after the initial dose.

Caudal analgesia was induced in primiparas when the cervix was nearly or fully dilated and the vertex in a normal anterior position. In multiparas caudal analgesia was induced when the cervix was dilated, 6 to 8 cm., depending on the activity of labor and the position of the presenting part.

## TECHNIC OF CAUDAL ANALGESIA

The malleable needle technic with 1.5 percent metycaine as the anesthetic agent was used for caudal analgesia. Several innovations

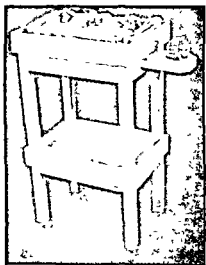


Figure 1.—Caudal tray stand.

not previously described were also applied. Figure 1 shows a readily constructed wooden stand to hold the caudal tray and figure 2, the tray at the patient's bedside. Figures 3 and 4 show a caudal roll that was used to keep the patient's weight off her abdomen while lying prone to facilitate insertion of the caudal needle.

After inserting the malleable needle, careful aspiration determined that the subdural space had not been entered. Eight cubic centimeters of the metycaine solution was then injected and in 5 minutes, if there was no paralysis of the lower extremities and again

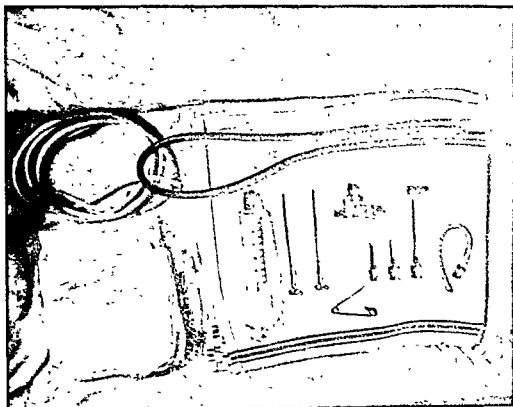


Figure 2—Caudal tray.

after careful aspiration, the remaining 22 cc. of the initial 30 cc. dose was injected. If by then the head was visible and the patient was judged to be ready for delivery, the caudal needle was removed and the patient was placed on the delivery table. If the patient was not ready for delivery, the continuous caudal analgesia apparatus was connected as described by Lundy<sup>10</sup>. Further doses of 20 cc. of the metycaine solution were administered every 30 to 45 minutes according to the level of anesthesia as determined by pin-prick (the optimum level of anesthesia was at the umbilicus) and the patient's subjective complaint of returning pain. The average total amount of 1.5 percent metycaine administered to primiparas was 50 cc. and to multiparas, 46 cc. The average duration of the caudal analgesia, as measured from the time of the first injection of metycaine until

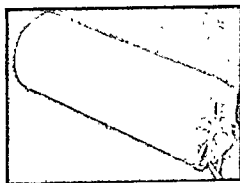


Figure 3—Caudal roll (length 18 inches, diameter 6 inches).

<sup>10</sup> LUNDY, J. S. Continuous caudal anesthesia in obstetrics. S. Clin. North America 25: 841-857, Aug. 1945.

*The First Issue of the*  
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*This medical journal is the joint monthly publication of the Medical Departments of the Army, Navy, and Air Force. It replaces the Bulletin of the U. S. Army Medical Department, published since 1922, and the U. S. Naval Medical Bulletin, published since 1907.*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Department of Defense to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

9 January 1950

TO: THE MEDICAL PERSONNEL OF OUR ARMED FORCES

The formation of the UNITED STATES ARMED FORCES MEDICAL JOURNAL is a result of the consolidation of the Bulletin of the U. S. Army Medical Department and of the U. S. Naval Medical Bulletin and marks another "first" in the annals of the Armed Forces of our country. It emphasizes the close unity and cooperation which have always existed among the medical personnel of the Army, Navy and Air Force. All of us are proud of their record and their epochal achievements in the past and I am certain that in the future, this medium will contain reports of accomplishments in military medicine of even greater significance to the health and welfare of the personnel of our Armed Forces and our Nation.

*Louis Johnson*



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## Hyperthyroidism

### Diagnosis and Treatment

URHO R. MERIKANGAS, *Colonel, MC, U.S.A.*<sup>1</sup>

**H**YPERACTIVITY of the thyroid gland is seen fairly often in the personnel of the Armed Forces and their dependents. Women show a higher incidence of this disease than men, the ratio being about 4:1 (1). No satisfactory explanation has been given for this observation, but perhaps the balance of the endocrine system is more easily disrupted in women than in men. The cyclic ovarian functional episodes doubtless also affect the thyroid, adrenal, and pituitary glands. Although the symptoms and signs of hyperthyroidism are classical and may be clearly demonstrated in most patients, some atypical and confusing findings may be present which must be properly and quickly evaluated in order to prescribe the appropriate therapy. The evaluation of the history and physical examination is more important than are such laboratory determinations as the basal metabolism rate, blood serum cholesterol level, urinary creatine excretion, and the blood protein-bound iodine determination.

Patients with hyperthyroidism may complain of excessive perspiration, which is warm rather than cold and clammy. Weight loss is unusual in that they ordinarily have an excellent appetite and ingest

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<sup>1</sup> The First Army Station Hospital, Fort Jay, N. Y.

large quantities of food. Their assimilation of this food is usually not disturbed by their moderate diarrhea. Probably a good deal of the weight loss is caused by muscular overactivity and increased nervousness and irritability, while some is a result of increased basal oxygen utilization. Nervousness is significant in that it responds better than the nervousness and irritability of a psychoneurotic patient to the care of a solicitous and sympathetic physician in whom the patient has confidence. Above all, patients with hyperthyroidism must be treated with sympathetic understanding at all times, by the physicians, nurses, and attendants.

Insomnia may be present but is usually not a major complaint as in patients with an anxiety neurosis or mental conflict. Muscle weakness cannot be relied on as a differential point since it is found in certain neurologic disorders, but it can be readily demonstrated clinically in the leg muscles. Lahey (2) states that there is actual muscular dystrophy in this disease. Practically all patients with true hyperthyroidism prefer cold weather. Exophthalmos is a variable diagnostic point that will be discussed in connection with therapy. Diffuse or nodular enlargement of the thyroid gland is associated, in most patients, with toxic activity, but occasionally patients, usually over 50, and more often over 60 years of age, show all the usual signs and symptoms of hyperthyroidism except that there is no palpable increase in the size of the gland, and no enlargement is demonstrated sub-sternally by roentgenographic studies. Lahey has called this state "apathetic hyperthyroidism." No immediate cause is known, but emotional trauma and acute upper respiratory infections seem to be precipitating factors in some patients. A large number of cases occur in the third and fourth decades, and the disease is commonly found in more than one member of a family.

#### PRESENT FORMS OF THERAPY

*Psychotherapy*, in the form of suggestion and assurance, has been used in treating most medical and surgical lesions throughout the ages, and can be of great help when used in conjunction with other measures. It is possible that psychotherapy alone could cause a remission of the disease.

*Thyroid extract* in carefully regulated doses has been given in the hope it might be of more value than the supposedly abnormal secretion produced by the diseased gland. By means of this drug the thyrotropic hormone of the anterior pituitary gland would be inhibited and consequently the symptoms of thyrotoxicosis would be diminished. According to McGavack (3) thyroid extract decreases the output of hormone by the thyroid gland but increases the metabolic process. Haines et al. (4) and Gargill and Lenses (5) report that thyrotropic hormone produces exophthalmos when it is found

in excess, and that it can be inactivated by thyroid tissue with subsequent improvement of the exophthalmic state.

*Irradiation of the pituitary gland* has been tried in animals in an effort to diminish the output of thyrotropic hormone, which can produce thyrotoxicosis and exophthalmos. This, however, is not practicable in human beings since other functions of the anterior pituitary gland are affected adversely.

*Irradiation of the thyroid gland* was used more frequently several years ago than at present to decrease the amount of functioning organ and thus reduce the symptoms and signs of hyperthyroidism. This did not prove satisfactory because of the difficulty in determining the correct dosage for proper results. The resulting fibrosis was also a disadvantage in that it added technical obstacles to surgery. Furthermore, fibrosis of other organs in the neck occurred.

*Radioactive iodine* with a half-life of 12 hours was used experimentally in 1938. Gargill and Lesses gave doses up to 25 microcuries (estimated at 0.5 to 1 microcuries per gram weight of thyroid). Good results were reported in 80 percent of the patients. Soley and Miller (6) used tracer doses of from 100 to 250 microcuries  $I^{131}$  and therapeutic doses of 1,000 to 2,000 microcuries in thyrotoxicosis and up to 50,000 microcuries in patients with metastatic carcinoma of the thyroid gland. They stated that the normal thyroid absorbed less than 30 percent of the administered radioactive iodine while the hypofunctioning gland absorbed much less, and the overactive gland absorbed 40 to 80 percent. Haines and his coworkers agreed but added that although radioactive iodine is useful, the clinic using it must have a well-qualified physicist, chemist, and hematologist in addition to the usual staff of physicians so that the treatment can be accomplished properly and safely.

*Iodine*, usually in the form of potassium iodide, has been administered since 1923 as a form of treatment of hyperthyroidism in itself, or more usually as part of the preoperative preparation of the patient. The mechanism of the action of iodine on the overactive thyroid is not understood, but it is thought that it inhibits the production of thyrotropic hormone by the anterior pituitary. The normal thyroid requires as little as 0.075 mg. of iodine daily for iodination and the formation of thyroxine (5). The hyperfunctioning gland calls for two or three times as much or more in order to cause involution of the gland and consequently decrease the basal metabolism rate and the other signs of toxicity. McGavack explained that excess potassium iodide interferes with the synthesis of diiodotyrosine and thyroxine in the thyroid gland both in vitro and in vivo. Barr stated that iodine alone seldom gives permanent relief of symptoms. Haines and his coworkers used Lugol's solution for the preoperative treatment of mild

cases of thyrotoxicosis. Bartels (7) also recommended this, with the advice to continue it until the full benefit is derived—a month or more before operation. Lahey (8) reported that some patients become iodine-fast and that their basal metabolism rate would not drop unless some antithyroid substance, such as propylthiouracil, were given alone. Barr stated that only 3 percent of patients with hyperthyroidism do not respond to iodine administration. Means (9) advised the use of iodine alone in the preoperative preparation of a pregnant patient with thyrotoxicosis, since he believed that iodine combined with an antithyroid drug may dangerously affect the fetal thyroid after the first trimester of gestation. Iodine slowed down the action of propylthiouracil (8) and the thiourea-inhibiting action was retarded by pretreatment with iodine, but the ultimate action was increased threefold (3). Most physicians probably consider iodine therapy as harmless, but Kyle (10) quoted a report of 7 patients with severe iodism, 1 of whom died, in a series of 400 patients treated at Johns Hopkins Hospital.

*Antithyroid substances* are now considered of the greatest value both for preoperative preparation and also for medical therapy in certain elderly patients, in those with cardiovascular disease, diabetes mellitus, asthma, or psychosis complicating thyrotoxicosis, and in those who refuse operation. The action of these substances can be better understood if we consider the formation of thyroxine, which is an iodine-containing amino acid. Inorganic iodine and tyrosine form diiodotyrosine, which through enzymatic action in the thyroid gland by cytochrome oxidase and peroxidase with manganese acting as catalyst forms tetraiodothyronine or physiologically active thyroxin. The biosynthesis of thyroxin is considered an intracellular, aerobic, and enzymatic process. Hypophysectomy in animals decreases the incorporation of iodine into the thyroid. In rats it has been demonstrated that the liver, muscles, and small intestines contain thyroxin and diiodotyrosine 2 to 8 months after complete thyroidectomy.

It is thought that propylthiouracil acts by interfering with the enzymatic system necessary in the production of thyroxine from iodine and not by preventing the absorption of iodine by the thyroid (7). Thus, it decreases synthesis of thyroid hormone, but since the pituitary thyrotropic stimulating hormone is not inhibited a compensatory hyperplasia of the thyroid occurs. This can be effectively balanced by giving Lugol's solution with the antithyroid drug. The involution produced by the iodine makes the gland firm and decreases its vascularity, thus facilitating the performance of a subtotal thyroidectomy later. Until 1948 subtotal thyroidectomies had been performed on 27,000 patients at the Lahey Clinic, of whom, since July 1943, 1,100 were prepared for operation by use of antithyroid drugs. In an

earlier series of 500 patients so prepared at the same clinic the mortality rate dropped from 0.88 to 0.17 percent.

Hyperthyroidism, caused by an excessive amount or an abnormally synthesized thyroxin, increases the catabolic effects on the liver, heart, muscles, intestinal tracts, and epiphyseal centers in young children, and on the retro-ocular fat and muscles. The retro-ocular changes seem to depend on an excessive thyrotropic hormone production from the anterior portion of the pituitary. Of the several thiourealike substances studied, propylthiouracil, and more recently, methylthiouracil, seem to be the drugs of choice for either medical therapy of hyperthyroidism or preoperative preparation in conjunction with iodine. Remission may occur with propylthiouracil used alone in mild cases, and although relapses also appear when the drug is stopped after 6 to 18 months of therapy, treatment with this type of drug affords the most logical treatment of thyrotoxicosis now known. As to the toxicity of propylthiouracil, Bartels (11) reported a series of 672 patients treated preoperatively, with 13 (1.9 percent) reactions, including 7 with leukopenia, 3 with agranulocytosis, and 3 with fever or an eruptive skin reaction. This compared favorably with the reactions in patients treated with thiouracil (15 percent), some of whom died from agranulocytosis or periarteritis nodosa.

*Subtotal thyroidectomy* is still the most widely accepted form of definitive therapy. In the large thyroid centers and in the hands of skilled surgeons, the results have been excellent. The object is to decrease the production of thyroxin by removing that amount of the gland—60 to 95 percent—that the surgeon believes will alleviate the signs and symptoms of thyrotoxicosis and yet not cause a state of hypothyroidism. This is a difficult problem, because there is no accurate means of determining this amount. Bartels of the Lahey Clinic reports the following complications: (a) immediate operative, such as recurrent laryngeal nerve paralysis or tetany following resection of the parathyroid, 0.5 percent; (b) myxedema, 2 percent; (c) recurrence of hyperthyroidism, 2 percent; and (d) operative deaths, 0.17 percent (7). Of the recurrent toxic cases about one-half are operated on again, and the other half are treated with Lugol's solution. The number of patients with complicating myxedema or latent tetany (low blood calcium levels but no clinical sign of tetany) is difficult to determine without a detailed clinical and laboratory follow-up of all patients operated on. The intractable form of exophthalmos is more frequently associated with myxedema occurring spontaneously after thyroidectomy or following thyroiditis (2). Since the exophthalmos is believed to be caused by an excessive production of anterior pituitary thyrotropic hormone, the best form of treatment, when it occurs in a patient with hyperthyroidism, is to reduce the signs and symptoms of



toxicity gradually with propylthiouracil. It is given alone at first, then combined with Lugol's solution, and as the basal metabolism rate and tachycardia are lowered, daily doses of 16 to 100 mg. of thyroid extract may be added in an attempt to control the thyrotropic hormone response (3).

### CASE REPORTS

*Case 1.*—A 28-year-old woman was admitted to the hospital on 13 May 1947 complaining of nervousness, weakness, and a voracious appetite of almost a year's duration. She had lost 21 pounds in the preceding 8 months, but had regained 5 pounds in the month just prior to admission. She had also noticed increased excitability and excessive perspiration. Occasionally she was aware of precordial pain and palpitation. In December 1946, 5 months prior to hospitalization, she felt a weakness and moderate numbness in the right arm after bowling so she consulted a private physician. He diagnosed her condition as "toxic thyroid disease with anemia" and prescribed Lugol's solution and injections of liver extract. General improvement was noted, but because of vomiting, the Lugol's solution was discontinued after 3 weeks. About 1 month later an organic iodine preparation was prescribed. She took this by mouth for 6 weeks. Slow abatement of symptoms continued, but she was still excitable in crowds. One month prior to admission, she developed a painful swelling of the feet and legs, and again saw her physician, who gave a few injections of a mercurial diuretic and reinstituted the iodine therapy. She was admitted to the hospital because she noticed blurring of vision, passed 4 or 5 soft formed stools daily, and the symptoms persisted. One sister has hyperthyroidism.

Physical examination revealed an alert woman weighing 110 pounds, 16 pounds less than her usual weight. Her deep reflexes were hyperactive. Her skin was warm and moist. She had a slight exophthalmos and a myopia with vision recorded as O D 20/70 and O S 20/100, correctible to 20/20 bilaterally. There was a fine tremor of the tongue and extended fingers. There was a moderately diffuse enlargement of the thyroid. Her pulse rate was 120. Moderate weakness of the quadriceps femoris muscles was present bilaterally.

A roentgenogram of the chest was normal except for slight prominence of the pulmonary conus. The electrocardiogram showed right axis deviation. The basal metabolism rate was plus 87 but dropped to plus 5 by 7 July and to 0 on 28 July, the day before operation. The hemoglobin was 10 per 100 cc. on admission, but increased to 13.5 in 3 weeks.

In addition to bed rest, sedation, and a nutritious diet supplemented by daily oral administration of 40 mg. of thiamine hydrochloride, the patient was treated daily with 45 drops of Lugol's solution, for 22 days. The iodine was discontinued because of a rather poor response, and 200 mg. of propylthiouracil were given daily in 4 doses, for 46 days. In the last 14 days (5 to 19 July) in this therapy 60 drops of Lugol's solution was also administered to further the involution of the soft thyroid. This was continued alone until 29 July when a thyroidectomy was performed under oral trichloroethanol and nitrous oxide-oxygen-ether anesthesia. The pathologic report was "hyperplasia with evidence of involution." The patient was discharged from the hospital on 8 August in excellent condition. The patient has been followed for at least 15 months postoperatively. She has appeared well and has regained her weight and strength. Recently she had a hysterectomy for bleeding uterine fibroids.

*Comment.*—This patient was treated too long on an expectant basis. If, after she entered the hospital, the propylthiouracil had been avail-

able sooner, the period of hospitalization might have been shortened by 3 or 4 weeks. The dosage of propylthiouracil should have been closer to 300 mg. daily at first, then decreased. Extra delay before operation was for the purpose of watching for a possible granulopenic reaction. This is not as necessary with propylthiouracil as it is with thiouracil. The patient certainly received excessive doses of iodine for the involution of hyperplastic thyroid. Ten drops, three times a day, of Lugol's solution would probably have been sufficient for this purpose.

*Case 2.*—A 26-year-old member of the WACS was admitted on 30 June 1947 complaining of nervousness and loss of weight. In September 1946 she noticed that her eyes were more prominent than usual. Soon after her hands began to tremble when she wrote and she would have dyspnea and palpitation on climbing a single flight of stairs. Even in cold weather she felt warm. No changes in her voice or vision were noted. She felt tired even with supposedly adequate amounts of sleep. She had been admitted to an Army general hospital in Germany in November 1946 with a basal metabolism rate of plus 90. Despite treatment, primarily with phenobarbital, bed rest, and a nourishing diet, she continued to lose weight, and was transferred in February 1947 to an Army general hospital in the Zone of the Interior. Here, for 3 months, 200 mg. propylthiouracil and up to 400 mg. phenobarbital daily was administered for 4 weeks, then the propylthiouracil was increased to 300 mg. daily. No Lugol's solution or other form of iodine was prescribed. The basal metabolism rate was plus 77; 1 week later it was plus 21; while 3 weeks later it was 65 and remained near plus 50 for the next 6 weeks. These tests did not seem reliable, and the physicians' and nurses' progress notes emphasized the uncooperative attitude of the patient and the irregularity of the doses of medicine she received. She was discharged from the hospital on a CDD without perceptible improvement in her general condition. While on terminal furlough her basal metabolism rate was plus 35 (recorded by a hospital in New York City) and she was admitted to this hospital.

The patient's parents had been killed accidentally when she was a child, and she had been reared by foster parents. She was married in 1946 for 6 months, but was separated for incompatibility. She was a rather profane person and smoked about 40 cigarettes daily. She had had a tonsillectomy and adenoidectomy in 1928, an appendectomy in 1934, a severe electric shock in 1943 from a high frequency radio set at which time her heart was alleged to have stopped temporarily; she fractured her left forearm in 1944. She was treated for gonorrhea in 1941, for asthenia in 1944, and for cystitis in 1946.

Physical examination revealed an undernourished woman with moderate bilateral exophthalmos with lid lag, and slight tremor of the tongue and fingers; skin was warm and moist. The thyroid was diffusely enlarged, extremely so on the right side. The apical beat was forceful and the pulse rate 90 to 130 per minute. The knee jerks were hyperactive. The electrocardiogram was normal except for a Q-T interval of 0.37 sec. Basal metabolic determinations were not satisfactory or reliable, varying from plus 20 to plus 70.

The administration of 20 drops of Lugol's solution three times a day did not produce a satisfactory response. Propylthiouracil was substituted 4 weeks later, giving 250 mg. daily, except for 1 week when 350 mg. were given daily. After 25 days of this medication, she was transferred to a neuropsychiatric hospital. During her stay in our hospital she had manifested definite homosexual patterns and was generally uncooperative. During her last week in this hospital and for

another 5 days in the new one, she had an episode of either feigned or hysterical bilateral blindness, which apparently was not complete. Hydrotherapy was required to control her manic behavior. Propylthiouracil was continued in doses of 300 mg daily for the next 10 days then gradually reduced to 50 mg, until on 17 September treatment with 10 drops of Lugol's solution three times daily was discontinued and the propylthiouracil was discontinued. A subtotal thyroidectomy was performed on 27 September. A moderately firm gland was found with low colloid and marginal vascularization, consistent with an involuting toxic thyroid. She was discharged on 24 November after further study of her personality traits and follow-up electrocardiographic studies. The Q-T interval returned to normal limits. The personality of the patient was materially unchanged 4 months postoperatively, although the signs of hyperthyroidism including the exophthalmos had improved.

**Comment**—The observation and treatment of this patient for a moderate to severe hyperthyroidism covered a period of 12 months in 4 hospitals, and her symptoms dated back about 3 months prior to the first hospitalization. This is too long a period for a patient in whom surgery was indicated as the definitive therapy. The operation was not performed at the second hospital, probably because of the patient's lack of cooperation. Perhaps the hyperthyroidism was the blame, but it is more likely that her altered personality was the greater obstacle. This is not a suitable case in which to evaluate the long but intermittent use of propylthiouracil, although it seemed to be of definite preoperative value.

**Case 3**—A 28-year-old man was admitted to the hospital on 20 October 1947 complaining of loss of 20 pounds in weight over a 4 month period, nervousness and irritability and propensity to weeping for almost a year. His hands were shake, he perspired freely and had palpitations. He had noticed his bow getting larger for several months. His mother died during an operation for toxic goiter.

Physical examination revealed a well nourished man who had lost weight. There was moderate exophthalmos and moderate diffuse enlargement of the thyroid. The pulse rate was 120 (on admission the basal metabolism rate was plus 40 and plus 6 after 5 weeks). The serum cholesterol increased from 176 mg per 100 cc of blood on 31 October to 278 mg on 30 December. The systolic-diastolic blood pressure was 170/100 on 30 December. The

beginning 7 November 300 mg of propylthiouracil was given daily for 3 weeks then 200 mg daily until 27 December when the drug was discontinued. Lugol's solution was given three times a day. The patient was considered ready for operation on 14 January 1948 and on 15 January 15 drops of Lugol's solution were given three times a day. This was continued through the time of the operation. Nevertheless, 1 day and until 27 January. The patient was considered ready for operation on 14 January but rather noticeable thyrotoxicosis which interfered with endotracheal intubation caused the postponement of the operation. Nevertheless, he was taken well to surgery and had no postoperative complications. He recovered to date on 12 February.

**Comment**—The patient was highly cooperative despite the unfavorable family history and the earlier preoperative technical difficulty. He made an excellent recovery and was well when seen 11

months after operation. The pathologic diagnosis in this case was "firm (involved) diffuse toxic goiter."

*Case 4.*—A 35-year-old woman was admitted on 12 January 1948 because of nervousness and weakness of 8 months' duration. At times she noted slight nausea, but her appetite was excellent. She had lost 10 pounds in the past 6 months. She felt somewhat tremulous and preferred cold weather to warm. For 2 months prior to admission she noted dyspnea and palpitation on climbing a single flight of stairs. At times her eyelids were swollen and for 2 weeks prior to admission she noted a slight swelling of her ankles. About 4 months earlier a private physician had prescribed iodine, which she took for 1 month with relief of weakness.

Physical examination revealed a well-developed woman who had a moderate staring appearance but no true exophthalmos. Her skin was warm and moist and there was a fine tremor of the extended fingers and tongue. The thyroid was moderately and diffusely enlarged; a bruit was heard on auscultation. The pulse was regular; rate of 128 to 146. The basal metabolism rate was plus 40 on admission and within 14 days had dropped to plus 11. The serum cholesterol was 187 mg. per 100 cc. blood.

Beginning 3 days after admission, 300 mg. of propylthiouracil was given daily for 11 days then 250 mg. daily for 14 days. Ten drops of Lugol's solution three times a day were also prescribed after 2 weeks, and continued for 13 days at which time thyroidectomy was performed (11 February). The propylthiouracil was not discontinued until 2 days prior to operation. One hundred and thirty milligrams of phenobarbital were given daily. She gained 14 pounds, her pulse rate decreased to about 72 per minute and she was generally improved. The operation was complicated by the fact that although the thyroid was firm on the left it was still friable on the right side. Nevertheless, the patient made an uneventful recovery and was discharged on 21 February.

*Comment.*—This patient demonstrated an excellent clinical response to propylthiouracil and iodine, but she did not receive the latter long enough to complete the involution of the thyroid. It is difficult to know whether the iodine and propylthiouracil together should have been given longer or whether the propylthiouracil should have been stopped sooner and the iodine given alone for at least another week. This patient was still in good health when seen 5 months postoperatively, and was at that time in the third month of pregnancy.

*Case 5.*—A 24-year-old married woman was admitted on 24 February 1948 complaining of nervousness and the loss of 14 pounds in the preceding 5 months. She was easily upset, felt some general lassitude, and noticed that her legs tired easily. She preferred warm weather to cold. Her appetite had not been good for the past 2 months, but she blamed this on the poorer quality of food she was able to buy. Her neck had been getting larger for 2 months.

Physical examination revealed a small woman of below average weight. She did not appear especially restless, nor did she have any exophthalmos. Her hands and feet felt warm, but were not moist with perspiration. The thyroid was slightly nodular with a greater increase in size on the right side. No bruit was heard. The pulse rate averaged 98. The erythrocyte count was 3,860 million and the hemoglobin 9.5 gm. per 100 cc. of blood. The basal metabolism rate was plus 50 and gradually decreased to plus 10 within 4 weeks.



plished in the out-patient clinic. The concurrent use of iodine and propylthiouracil seems to be a more effective preoperative treatment than either one alone in the more serious cases, unless the patient has a large thyroid gland. In the latter case Kyle (10) believes propylthiouracil alone is better. He also states that after 3 months of therapy with propylthiouracil the thyroid gland becomes less friable.

### CONCLUSIONS

The study of hyperthyroidism in the Armed Forces should be encouraged, and a definite plan of action by the internist in conjunction with the surgeon should be outlined for each patient. Facilities in at least one central laboratory of the Armed Forces should be developed for the determination of protein-bound blood iodine levels to aid in the diagnosis of equivocal cases of thyroid gland disturbance.

### REFERENCES

1. BARR, D. P.: Textbook on Medicine, by Russell L. Cecil. 7th edition. W. B. Saunders Co., Philadelphia, Pa., 1947. Pp 1326-1333.
2. LAHEY, F. H.: Surgery of thyroid gland. *New England J. Med.* 236: 46-62, Jan. 9, 1947.
3. MCGAVACK, T. H.: Status of antithyroid substances in thyroid disease. *Am. J. Med.* 5: 90-99, July 1948.
4. HAINES, S. F.; KELSLEY, M. P.; WILLIAMS, M. M. D.; and KEATING, F. R., JR.: Some recent advances in study of the thyroid, their influence on treatment of thyroid disease. *M. Clin. North America* 32: 951-965, July 1948.
5. GARGIL, S. L., and LUSSES, M. F.: Medical progress; diseases of thyroid gland. *New England J. Med.* 235: 717-728, Nov. 14, 1946.
6. SOLEY, M. H., and MILLER, E. R.: Treatment of Graves' disease. *M. Clin. North America* 32: 5, Jan. 1948.
7. BARTLES, E. C.: Thiouracil and allied drugs in hyperthyroidism. *New England J. Med.* 238: 6-11, Jan. 1, 1948.
8. LAHEY, F. H.: Modern management of thyroid disease. *Bull. U. S. Army M. Dept.* 8: 294-301, April 1948.
9. MEANS, J. H.: Treatment of complicated or neglected toxic thyroid disease. Lecture before the New York Academy of Medicine, Oct. 15, 1948.
10. KYLE, L.: Unpublished "Discussion of Treatment of Hyperthyroidism," at a Medical Seminar at Walter Reed General Hospital, Washington, D. C., Sept. 1948.
11. BARTLES, E. C.: Agranulocytosis during propylthiouracil therapy. *Am. J. Med.* 5: 48-52, July 1948.
12. STARR, P.: Unpublished lecture on "Thyroid Gland and Heart Disease," A Short ACP Course. Los Angeles General Hospital. April 1948.
13. RIGGS, D. S.; LAVIETTES, P. H.; and MAN, E. B.: Investigations on the nature of blood iodine. *J. Biol. Chem.* 143: 363-372, April 1942.



# Extrusion of Redundant Gastric Mucosa into the Duodenum

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THE terms, herniated, prolapse, extrusion, and protrusion of the gastric mucosa have been used interchangeably for the pathological condition in which the gastric mucosa is found sliding through the pyloric ring into the duodenum. As pointed out by Noigore and Shuler (1), the term extrusion means "a pushing out or forcing out by expulsion"; and is probably as correct a description of the condition as any.

This condition occurs so frequently that it must always be considered as a possible etiologic factor in upper gastrointestinal complaints. In a review of the literature to date concerning this and related conditions there have been 51 cases reported with surgical confirmation of the condition found after routine gastrointestinal study. Rees (2) found 0.23 percent in approximately 5,000 examinations. Scott (3) found 1.04 percent in 1,312 routine examinations. Nygaard and Lewitan (4) reported 1.625 percent in 800 examinations. In the past 21 months at this hospital we found 30 cases or 2.88 percent in 1,071 successive routine gastrointestinal studies. It is believed that the cases reported here represent the largest single series confirmed by surgery. Eliassen, Pendergrass, and Wright (6) in 1926 believed they were reporting the first 2 cases. However, it is now known that von Schonne (7) had previously reported this condition in 1911. The largest series of surgically treated cases was reported by Scott (3) in 1916; 5 cases of 15 reported were operated upon. Archer and Cooper (8) in 1932 reported 4 cases, all of which were proved at surgery. Pendergrass and Andrews (9) in 1935 reported 3 cases confirmed by surgery. The remaining reports are limited, concerning 1 or 2 operated cases.

## ETIOLOGY AND PATHOLOGY

The underlying etiological factors in extrusion of the gastric mucosa through the pyloric ring are not definitely known. Several

theories have been proposed. Eliassen and Wright (10) believe that it is a result of a local hypertrophy of the gastric mucosa following a low grade inflammation and that the hypertrophied folds are swept along through the pylorus by peristaltic action. Rees (2) advances the theory that narrowing of the pyloric lumen precedes the hypertrophy of the gastric mucosa. The narrowing of the pyloric ring causes hyperperistalsis of the stomach and in an effort to force the gastric contents through the opening, mobilization of the mucosa and gradual protrusion through the pyloric ring occurs. Scott (3) is of the opinion that neither of these theories is fully supported by his study. He found no roentgenologic, gastroscopic, operative, or pathologic evidence of gastritis. Neither did he believe that there was any evidence of a narrowing of the pyloric ring. In our series of nine cases in which surgery was performed, the pyloric ring was always palpated prior to section. In all instances the pyloric ring was believed to be constricted either by spasm or hypertrophy. In two instances, there was evidence of trauma to the hypertrophic mucosal folds from the constricted pyloric ring. One case visualized from the duodenal side revealed a rosette of red edematous gastric mucosa protruding through the pylorus, analogous to protruding hemorrhoids. There was no evidence of generalized gastritis, either gross or microscopic. It is, therefore, our opinion, that the underlying etiologic factor may be primarily either a spasticity or hypertrophy of the pyloric musculature. Comparative study of sections of the pyloric ring has not been done in our cases. Sections of the protruded gastric mucosa have been available since, in one case, a partial gastrectomy was performed and in five other cases the redundant mucosa was excised. Histologic examination showed a moderate lymphocytic infiltration of the submucosa but insufficient evidence to establish a diagnosis of chronic gastritis.

### SYMPTOMS

The symptoms of extruded gastric mucosa are varied, often indefinite and vague, and the severity is undoubtedly dependent upon the degree of spasm. Several previously reported cases were first labeled as gastric neuroses. The complaints will, in general, fall into the following groups:

*Epigastric pain or upper abdominal distress* of some type was present in all cases. It varies as to severity and type. In some patients it may be only a discomfort or a feeling of fullness; in others it may be intermittent and cramplike and aggravated by the intake of solid food. It may be confused with an ulcer-type pain. This is particularly true in those relieved by a Sippy diet and antispasmodics. Many became



asymptomatic under an ulcer regime. Many had only partial relief of symptoms when on a soft diet and anti-spasmodics.

*Abnormal sense of fullness after the consumption of a small amount of food* is a very common symptom and was noted in a high percentage of our patients. In several this was the outstanding symptom. It may or may not be related to any particular type of food.

*Vomiting* is a frequent occurrence and is nearly always preceded by a sense of fullness. Several patients induced vomiting by gagging themselves for relief of discomfort.

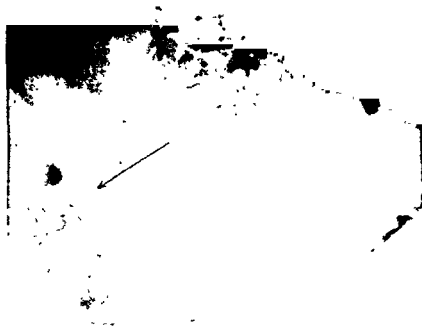


Figure 1—Considerable protrusion of redundant gastric mucosa, into the duodenal bulb which responded to dietary management and antispasmodics and removal of disturbing emotional factors



Figure 2. (Preoperative)—A minimal cauliflower defect in the bulb which was unrelieved by medication for 7 months.

*Hemorrhage* was reported as a common complication. It may appear only as intermittent occult blood in the stool. It has been reported, however, as acute episodes of profuse bleeding resulting in collapse. None of our patients had evidence of gross bleeding; they were not studied for occult bleeding.

*Loss of weight* was not an outstanding symptom. It was found in several patients who had limited their food intake because of discomfort. Interestingly enough, one patient in this series developed symp-

toms following a weight gain of 90 pounds after release from a Japanese prison.

*Gaseous eructation* was such a common symptom that study for gall-bladder disease was nearly always done.



Figure 3. (Postoperative).—Normal appearance of stomach and duodenum after pyloroplasty.

*Associated nervousness* was frequently present. Many patients with extruded gastric mucosa were considered to have functional complaints.

The diagnosis of extrusion of the gastric mucosa of the stomach into the duodenum can at times be suspected from the clinical history. However, the establishment of the diagnosis must be made by radio-

graphic examination, but can easily be overlooked by the radiologist if he does not keep the entity in mind at all times. The filling defect due to extrusion of the gastric mucosa into the duodenal bulb is found at the base of the duodenal bulb immediately distal to the pyloric opening.



*Figure 4.—Extreme prolapse of redundant gastric mucosa into the bulb producing a mushroom defect. Pyloroplasty with resection of the mucosa relieved all symptoms.*

The protruding folds of hypertrophic mucosa form a "cauliflower" or "mushroom" appearing area of decreased density in the shadow of the duodenal bulb. This shadow of decreased density will vary noticeably in size and shape during an examination and at times may become

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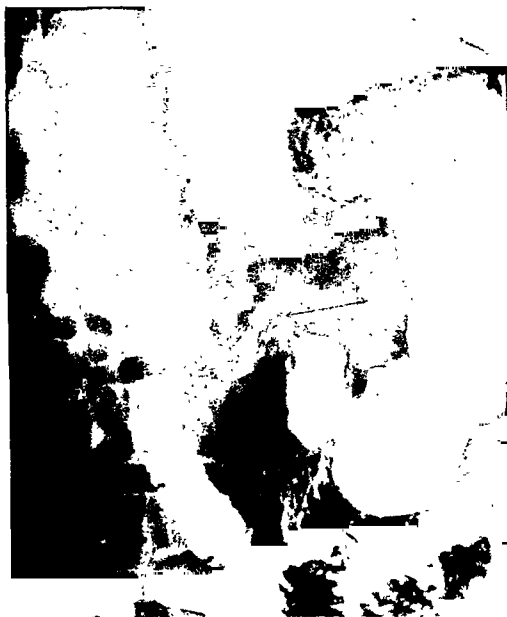


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spastic. In duodenitis, the bulb is spastic, very irritable, and empties rapidly; the mucosal pattern is coarse and irregular and the typical defect noted at the base of the duodenal bulb is not visualized. Small single folds of gastric mucosa which normally extend across the pylorus into the duodenal bulb are often visualized. This was pointed out by Scott (3) as being a normal variation and not an extrusion of the gastric mucosa. Figures 1, 2, 3, 4, and 5 are representative films from our series of nine cases.

#### TREATMENT

Many cases have been kept symptom-free under medical management. This is proof that the condition is certainly one that does not always require surgery. In a review of the cases reported it is evident that surgical treatment was not considered until medical management had failed.

In our opinion, a surgical procedure would not be indicated when the patient remains asymptomatic under a fairly limited medical regime. In some, however, the complete relief of symptoms requires strict adherence to a limited diet and the continuous use of antispasmodics. Often this is not only a great burden to the patient, but also incompatible with an active life. Surgery is certainly indicated in those with persistent pain, hemorrhage, or vomiting.

Various surgical procedures have been done for this condition. Ferguson (5) states that the treatment should be directed toward removing the prolapsed mucosa, short-circuiting the diseased area, or enlarging the pyloric outlet. In the cases reported this has been done by some type of pyloroplasty, by gastrojejunostomy, and, in a few cases, by partial gastrectomy.

Gastrojejunostomy has failed to relieve symptoms according to Nygaard and Lewitan (4) and Rees (2). This procedure is probably contra-indicated. Although it provides an unobstructed outlet for the stomach, it in no way would prevent a hypertrophic fold of mucosa from being swept through the pylorus.

A partial gastrectomy is a procedure which undoubtedly removes the pathologic condition, but it appears to be radical. Even though the morbidity and mortality for gastrectomy has, in recent years, been reduced to a minimum, it carries a greater risk than excision of the gastric mucosa and some type of pyloroplasty.

Eight of our patients have been treated by pyloroplasty. In six the redundant mucosa was also excised. In one patient, in whom there was evidence of a prepyloric ulcer, gastric resection was done. In all cases in which pyloroplasty was performed, the pylorus was inspected through a small incision on either the anterior surface of the stomach or the duodenum before sectioning the pyloric ring. Digital exami-



completely reduced and therefore will not be visualized. Usually, during the examination, there is slight tenderness elicited on palpation over the duodenal bulb.



*Figure 5—Extreme protrusion of redundant gastric mucosa into the bulb.*

The differential diagnosis is not too difficult. The deformity produced by duodenal ulcer after healing is usually extremely irregular in appearance and usually involves portions of the duodenal bulb other than the base. Active duodenal ulcer will usually show a crater, ulcer niche, or incisura. An ulcer crater with radiating stellate lines creates a different appearance than the protruded gastric mucosa. The duodenal bulb in the case of ulcer usually empties quickly and is rather

spastic. In duodenitis, the bulb is spastic, very irritable, and empties rapidly; the mucosal pattern is coarse and irregular and the typical defect noted at the base of the duodenal bulb is not visualized. Small single folds of gastric mucosa which normally extend across the pylorus into the duodenal bulb are often visualized. This was pointed out by Scott (3) as being a normal variation and not an extrusion of the gastric mucosa. Figures 1, 2, 3, 4, and 5 are representative films from our series of nine cases.

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nation revealed a narrowed pylorus in all cases with gastric mucosa protruding into the duodenum. Sections of the pylorus were not taken for biopsy and consequently we cannot definitely say whether or not the apparent narrowing of the pyloric ring was the result of hypertrophy or spasm. In those cases in which the mucosa was extremely redundant the mucosa was tented with an Allis forceps, freed from the underlying submucosa, and excised. The remaining free edge of the mucosa was sutured to the pyloric ring. In all cases the incision across the duodenum and stomach was sutured in a line opposite to the longitudinal incision, according to the procedure attributed to Mikulicz.

The immediate postoperative course in all cases was entirely uneventful. Wangensteen suction was maintained for 3 days and the patients rapidly progressed until they were on a full diet.

It is perhaps too early to evaluate the results, since our first case was done only 2 years ago. All the patients on whom surgery was performed have remained symptom-free on an unrestricted diet. All were active service personnel and returned to full duty status.

#### SUMMARY

Extrusion of the gastric mucosa occurs much more frequently than is commonly thought. Thirty instances were found in approximately 1,000 patients, and 9 cases were treated surgically with excellent results. The diagnosis should be suspected from the symptoms, but can be confirmed only by roentgen examination.

Surgery is indicated in those patients not responding to diet and antispasmodics. Excision of the extruded mucosa with pyloroplasty is probably the procedure of choice for this condition.

#### REFERENCES

1. NORCRO, M. and SULLER, J. D. Extrusion of gastric mucosa through pylorus. *Surgery* 15: 472, 1945.
2. REES, C. E. Prolapse of gastric mucosa through pylorus, surgical treatment. *Surg. Gynec. & Obst.* 64, 689, 1937.
3. SCOTT, W. G. Radiographic diagnosis of prolapsed redundant gastric mucosa into duodenum with remarks on clinical significance and treatment. *Radiology* 46: 547, 1946.
4. NAGARD, K. K. and LEWIS, A. Transpyloric herniation of redundant gastric mucosa. *Am. J. Surg.* 75: 504, 1948.
5. FERGUSON, I. A. Prolapse of gastric mucosa. *Ann. Surg.* 127: 879, 1948.
6. THASER, E. L., PRINDEGRASS, E. P., and WRIGHT, V. W. M. Roentgen diagnoses of pedunculated growth and gastric mucosa prolapsing through pylorus: review of literature. *Am. J. Roentgenol.* 15: 205, 1929.
7. VOX SCHUMPER, cited by C. E. Rees (2).

8. ARCHER, V. W., and COOPER, G., JR.: Prolapse of gastric mucosa. *South. M. J.* 32: 252, 1939.
9. PENDRGRASS, E. P., and ANDREWS, J. P.: Prolapsing lesions of gastric mucosa. *Am. J. Roentgenol.* 31: 377, 1935.
10. ELIASSEN, E. L., and WRIGHT, V. W. M.: Benign tumors of stomach. *Surg., Gynec. & Obst.* 41: 461, 1925.



H. R. COGBURN, M. D., *The Sulfonamides in Dermatology*,  
The Journal of The Medical Association of the State  
of Alabama, Vol. 18, No. 4, 93-96, October 1949.

Many deaths have occurred from the use of sulfa drugs. In 1941 New York City alone reported 28 known sulfonamide deaths. Many more were suspected.

Grollmann and Slaughter in 1947 estimated that there is one death in every 4,000 persons given chloroform anesthesia. They report that in properly hospitalized patients, receiving adequate medical and nursing care, there is 1 death in every 2,853 patients receiving sulfa drugs. \* \* \* Bentley Philips reports that of 2,500 soldiers treated by dermatologists in several military hospitals for various skin diseases during the recent war 4.11 percent were found to be sulfonamide dermatitis. In no case did dermatitis occur when the patient had been treated for less than 4 days. Local application of the sulfonamide for a superficial skin condition was found in each case.

The suggestion is offered that we refrain from using sulfa drugs topically for insignificant skin lesions that will respond to other known medicinals that are not so prone to irritate or sensitize the patient. The plea is made that we not give sulfonamides systemically for minor ailments.

# Gunshot Wounds in the 8th Air Force in World War II

JAMES A. RAFFERTY, M. D.<sup>1</sup>

ONE of the primary concerns of the surgeon of a combat unit has always been the treatment of wounds incurred in battle. Prior to 1900 the treatment of such wounds was almost the only duty of the military surgeon. Today military medicine embraces all the specialties of civilian medicine and such additional specialties as aviation medicine and medical logistics. The retention of the title "surgeon" for officers, regardless of their medical specialty, is a reminder of their origin. The following study of gunshot wounds was prepared from the records of the Bomber Command of the 8th Air Force, European Theater of Operations, January 1943 through June 1945. These records are unusually thorough and complete.

During the war the flight surgeon of each unit made out a weekly Care of Flyer Report and forwarded the report to the Office of the Air Surgeon in Washington, D. C. These reports were sequentially used for administrative decisions. After the war the reports were sent to the Department of Biometrics, School of Aviation Medicine, Randolph Field, Tex., for statistical analysis. Each item on each report was coded and a series of punch cards were prepared. Incidence rates were computed on the basis of weekly mean flying personnel strength. A number of special studies based on these data are available through the secretary of the school. Pertinent results on gunshot wounds are given in tables 1 and 2.

## DISCUSSION

These tables do not show the importance of gunshot wounds as a factor in the loss of combat personnel. This information may be found elsewhere (1) (2). Gunshot wounds in this bomber command occurred at the rate of 90 cases per 1,000 men annually in the 2½-year period covered. One-fourth of these were permanently removed from flying duty for medical treatment. There were 700 missing or killed in action per 1,000 men annually in the same period. A large percent of the latter were the result of gunshot wounds of one sort or another, but the care of these casualties did not contribute to the workload of

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the flight surgeons. Using these estimates and assuming that a man is on duty for an average of 6 months before he becomes a casualty, the noneffective rate caused by casualties was about 35 percent, and that caused by gunshot wounds was about 1 percent. All medical reasons, including gunshot wounds, amounted to 10 percent. Thus, the treatment of gunshot wounds was one-tenth of the total medical problem. It may be noted that head colds accounted for a noneffective rate of about 1 percent.

Table 1 shows trends for the 2½-year period of hostilities in the European Theater of Operations in regard to (a) the absolute magnitude of the occurrence of wounds (number of removals); (b) the relative magnitude of these occurrences (rate per 1,000 men annually); and (c) the nature of the wounds (percent distribution by type of missile). The number of removals for the second and third quarters of 1944 reflect the maximum in aerial combat effort associated with the Normandy invasion. The rate of gunshot injuries was high early in 1943 when our airmen were inexperienced, and again early in 1944 when the enemy was making a last stand for air supremacy. The superiority of Allied air power is evident in the data for late 1944 and early 1945. A notable shift in the type of missile

TABLE 1—Removals from flying status because of gunshot wounds, by quarters for the Bomber Command, 8th Air Force, January 1943–June 1945

NUMBER OF REMOVALS

	1943				1944				1945	
	I	II	III	IV	I	II	III	IV	I	II
All missiles.....	110	246	380	411	627	1,055	1,080	651	602	117
Flak.....	26	76	161	190	376	778	923	551	508	74
Cannon shell.....	36	92	136	174	179	155	55	21	19	12
Secondary missile <sup>1</sup> .....	0	26	39	10	27	59	61	53	41	11
Machine gun bullet.....	3	31	42	29	27	39	16	12	11	5
Other <sup>2</sup> .....	45	21	2	8	18	24	25	14	20	15

RATE PER 1,000 MEAN FLYING STRENGTH PER ANNUM

All missiles.....	221	185	155	101	126	110	115	71	62	18
Flak.....	52	58	66	47	75	149	99	60	53	11
Cannon shell.....	72	70	55	43	36	22	6	2	2	2
Secondary missile <sup>1</sup> .....	0	20	16	2	5	8	7	6	5	2
Machine gun bullet.....	6	22	17	7	8	6	2	1	1	1
Other <sup>2</sup> .....	91	15	1	2	5	3	1	2	1	2

PERCENT

All missiles.....	100	100	100	100	100	100	100	100	100	100
Flak.....	23.6	30.9	42.3	46.3	60.0	73.7	63.5	81.7	84.4	63.2
Cannon shell.....	72.7	77.4	35.8	42.3	28.5	17.7	5.1	3.2	7.3	10.3
Secondary missile <sup>1</sup> .....	0	10.6	10.3	2.4	4.3	5.6	5.6	8.1	7.3	9.4
Machine gun bullet.....	2.7	12.6	11.1	7.1	4.3	3.7	1.5	1.8	1.8	4.3
Other <sup>2</sup> .....	41.0	8.5	.5	1.9	2.9	2.3	2.3	2.2	3.3	12.6

<sup>1</sup> Plane fragments and equipment, a gunshot being the underlying cause of the wound

<sup>2</sup> Includes small arms fire, rocket shells, and "missile not reported"

NOTE: High percent in "Other" early in 1943 probably attributable to incomplete reporting.

producing the gunshot wounds is depicted in table 1. The reduction in percent of cannon shell wounds and the increase in percent of flak wounds is a measure of the change from offensive to defensive operations on the part of the enemy. Readers with detailed historical knowledge may well differ with these interpretations, or may find further interesting historical explanations for minor fluctuations in the statistical results of table 1.

Surgeons actually concerned with the medical treatment of gunshot injuries want to know the types of surgical problems generated by gunshot wounds. Although no direct information in this regard is available in our study, certain indirect information is given in table 2. With reasonable medical inference, one can imagine the type of medical situations presented by a flak wound of the leg as opposed to a machine gun wound of the chest. The data in table 2, then, are relevant to the care and prevention of wounds. By perusing these data a surgeon can anticipate the types and proportions of surgical operations he would expect to perform under the combat conditions of the 8th Air Force. Moreover, the flight surgeon can study vulnerability and institute remedial measures.

In table 2, one notices that about 75 percent of the wounds occurred in the head and extremities. It would be interesting to compare this

TABLE 2—Removals from flying status because of gunshot wounds, according to site of injury. Bomber Command, 8th Air Force, January 1943-June 1945

NUMBER OF REMOVALS

	All sites	Leg	Head and neck	Arm	Chest and abdominal	Buttock and hip	Abdomen	Back	Internal regions	Multiple sites
All missiles	5,279	1,664	1,124	967	285	153	79	66	20	612
Flak	3,611	1,272	677	744	288	119	42	54	11	474
Cannon shell	879	214	140	112	41	21	16	—	3	265
Secondary missile	330	27	271	16	5	0	1	1	0	27
Machine gun bullet	215	70	34	34	20	9	4	2	1	27
Other <sup>1</sup>	142	75	32	21	11	1	2	0	3	19

PERCENT BY SITE

	All sites	Leg	Head and neck	Arm	Chest and abdominal	Buttock and hip	Abdomen	Back	Internal regions	Multiple sites
All missiles	100	31.4	21.3	18.3	5.4	2.9	1.5	1.2	0.4	11.9
Flak	100	35.2	18.7	20.3	7.9	3.3	1.1	1.5	.4	12.9
Cannon shell	100	24.4	15.1	12.5	4.9	2.7	1.8	.8	.3	12.5
Secondary missile	100	8.2	76.0	5.5	1.5	0	.3	.3	0	8.2
Machine gun bullet	100	32.6	15.8	15.8	9.3	4.2	1.9	.9	.5	12.2
Other <sup>1</sup>	100	52.8	22.5	14.8	7.7	.7	1.4	0	2.1	9.9

PERCENT BY MISSILE

	Flak	Cannon shell	Secondary missile	Machine gun bullet	Other <sup>1</sup>
All missiles	62.2	16.4	4.3	4.1	3.6
Leg	76.9	12.9	1.6	4.2	4.6
Head and neck	5.8	11.3	72.3	1.0	2.4
Arm	77.0	12.3	1.9	3.3	3.3
Chest and abdominal	14.8	15.7	1.3	3.2	2.9
Buttock and hip	7.7	2.2	0	3.9	7
Abdomen	1.5	2.2	1.6	11.6	2.9
Back	1.2	1.7	1.6	2.1	0
Internal regions	0.4	1.0	0	5.0	15.0
Multiple sites	11.9	11.4	0	4.4	2.3

<sup>1</sup> Includes wounds caused by incendiary bombs, gas, and other causes not reported.  
<sup>2</sup> Includes wounds caused by incendiary bombs, gas, and other causes not reported.

figure with the percent of body area presented by these parts taking into consideration all directions of attack. The percent of exposure offered by the head and extremities should agree with the rate of occurrence of wounds in these sites. Such comparisons are useful in assessing the value of protective devices on or about various parts of the body. For example, during parts of the war, air crews wore flak suits, or trunk armor not unlike the bulletproof vests of gangsters. Assuming that the percent of exposure of the head and extremities is 60 percent in random three-dimensional gunshot attacks on a man in a sitting position,<sup>1</sup> the flak suit was valuable in preventing serious abdominal and chest injuries. It should be further noted that the head and neck were hit by at least 76 percent of the slow velocity, secondary missiles (table 2). Clothing and armor were apparently sufficient to stop most of these missiles, only the face being exposed.

#### REFERENCES

1. RAFFERTY, J. A., and CUTLER, S. J. Types and extent of illnesses in the 8th AAF during War II, unpublished.
2. CUTLER, S. J., and RAFFERTY, J. A.: Medical experiences of the U. S. 8th Air Force, Jan. 1943-June 1945, Project No. 21-02-014, Report No. 3, School of Aviation Medicine. Randolph Field, Tex., Feb. 1949.

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<sup>1</sup> Determination of the percent of exposure is not simple. Minimal requirements include photographing from numerous directions, measuring areas, weighting for nonrandomness resulting from airplane structure, and averaging. It should also include three-dimensional mathematical analysis. The figure used here is a rough personal estimate based on 30 minutes' examination of a colleague sitting at his desk.





# Administration of Procaine Intravenously

## III. In Traumatic Surgery<sup>1</sup>

REGINALD J. M. ZILFF, Captain, MC, U. S. A.<sup>2</sup>

SINCE procaine is believed to act peripherally, crossing the permeable capillary membrane and bathing the terminal axone endings, its use in the treatment of traumatic injuries, burns, and other conditions in which the pain stimulus is superficial, seems almost specific. In the early part of the war Gordon (1) found that procaine could be used intravenously with excellent results in the care and treatment of burns, and that solutions of 0.1 and 0.2 percent procaine started as an infusion shortly before the change of surgical dressings and débridement provided adequate analgesia for these procedures even though no morphine or other agent was used. This analgesia lasted several hours so that the patients were able to rest comfortably. The use of procaine intravenously is not associated with the respiratory depression so frequently seen in deep sedation with morphine. Its possibilities as a valuable agent in the management of burned patients who have inhaled an irritating smoke or gas can, therefore, be readily appreciated.

Although Tovell (2) found procaine given intravenously to be excellent while changing the dressings in burned patients and while performing superficial débridement, he found it necessary to use pentothal or some other agent when an extensive débridement was performed. Fraser (3) has used a solution of pentothal-procaine intravenously in the treatment of postoperative pain. He mixed 0.5 gm. of pentothal and 0.5 to 1 gm. of procaine in 1,000 cc. of 5 percent *d*-glucose in water or saline solution and gave it as a continuous slow infusion. On a well-controlled postoperative recovery ward where adequate facilities are available, this might prove to be a valuable method of controlling severe postoperative pain and pain in severely burned patients.

In the treatment of traumatic injuries the primary objective is the elimination of pain, vaso-spasm, and edema. Procaine given intra-

<sup>1</sup> Parts I and II of this series were printed in the December 1942 issue of *The Bulletin of the U. S. Army Medical Department*.

<sup>2</sup> From General Hospital, Fort Sam Houston, Tex.

venously is of great value in the management of these cases. The case reports of three patients recently treated in this manner are presented.

### CASE REPORTS

*Case 1.*—A 32-year-old man was admitted following an airplane crash, with dislocation of the third and fourth cervical vertebrae, fracture of the lamina of the third cervical vertebra, dislocation of the left hip with fracture of the acetabulum, comminuted fracture of the left talus, lacerations of the scalp and hands, and a hemothorax on the right side. Continuous traction was applied to the head by Crutchfield tongs. Opiates did not relieve the pain except in doses that depressed the respirations to dangerous levels. Five hundred cubic centimeters of 0.2 percent solution of procaine were administered intravenously. Shortly after the infusion was started the patient stated that he was comfortable for the first time since entering the hospital. He subsequently received procaine two or three times daily with codeine administered only in the middle of the night. This was continued for 2 weeks with no narcotics administered during that period in the daytime.

*Case 2.*—A 26-year-old man incurred a gunshot wound of the left axilla that did not involve the axillary artery. While he was still under general anesthesia, a stellate ganglion block was performed on the affected side, using the anterior approach, resulting in good warming of the extremity. In an effort to prolong the effects of the block as well as to control postoperative pain, 500 cc. of 0.2 percent procaine were administered intravenously twice daily. It was found that the extremity was kept almost as warm by this means as with the stellate block. The amount of opiates required was definitely reduced.

*Case 3.*—A 24-year-old woman sustained a gunshot wound of the left ankle. Skin grafts had been applied but had broken down, and a valgus deformity developed. Six months after her injury under spinal anesthesia using 60 mg. of procaine, the ankle was manipulated (with some bleeding of the wound) and a plaster cast was applied. The anesthetic wore off after about 90 minutes, and the patient suffered a great deal of postoperative pain. Fifty milligrams of Demerol intravenously and 50 mg. intramuscularly were administered with relief of pain and the patient went to sleep. One hour later, the patient awoke and complained of severe pain in the ankle. There was no excessive swelling of the exposed portions of her toes and no cyanosis. Since it was not deemed desirable to repeat the narcotic so soon, 10 cc. of 1 percent procaine were injected at the rate of 2 cc. per minute. At no time did the patient exhibit any untoward neurogenic or circulatory reactions. When the injection was completed she stated the pain was beginning to leave her and that the lower portion of the affected extremity was growing numb. In 10 minutes she was able to sleep and remained comfortable for 2½ hours.

This case illustrates the use of procaine intravenously in a 1 percent solution. Although in this country we are taught to avoid injecting 1 or 2 percent procaine into a vein, the French inject 1 percent procaine intravenously in doses of 100 to 200 mg. (10 to 20 cc. of a 1 percent solution) over a period of 2 to 5 minutes for the same indications that we use solutions of 0.1 and 0.2 percent. The possibilities of this method should be investigated, for if the drug can be given in this manner with reasonable safety, it would be advantageous from

the standpoint of the amount of time saved and the promptness with which relief is obtained.

Procaine may also be given intravenously before reducing fractures, but reduction is usually not possible with this agent alone (4). After reduction, procaine is a valuable agent for controlling pain and aiding the physical therapist in getting a wider range of motion with less discomfort to the patient. In sprains with no roentgenologic evidence of fractures single infusions of procaine promptly reduce the pain and increase motility. In ruptured intervertebral disc, if the pain is caused by a mechanical factor, an infusion of procaine gives no relief from the pain. It may, therefore, be used as an aid in the differential diagnosis of low back pain. In myofascitis, the low back pain and spasm caused by inflammatory conditions respond well to this treatment. Relief usually lasts several hours. The average patient requires about two infusions daily for 2 or 3 days, then three infusions in a 2-week period. In traumatic arthritis and causalgias excellent results have been achieved by the use of this drug.

In urticaria associated with transfusion reactions, although procaine infusions will not always clear the rash, it usually will alleviate the itching and increase the comfort of the patient. Although procaine does not prevent death in immediately threatening or severe embolic syndromes, at least it causes instantaneous disappearance of pain, dyspnea, anxiety, and the sensation of impending disaster in most such cases (5). Knight (6) has used 10 mg. of procaine to each 25 mg. of pentothal intravenously for hiccups that not infrequently develop following upper abdominal operations. The author has used 2 or 3 cc. of 1 percent procaine intravenously with excellent results after hiccups have developed in the course of an operation. In acute thrombophlebitis the rapid relief from pain achieved by a lumbar sympathetic block is well appreciated. Procaine given intravenously prolongs the effect of the block as has been shown by repeated temperature checks.

In postoperative anuria caused by reflex inhibition, procaine infusion will block this reflex arc and overcome vaso-spasm and renal cortical ischemia which cause arrest of urinary excretion (7). One patient, anuric for 48 hours, with thrombosis of the abdominal aorta extending above both renal arteries (demonstrated at autopsy), excreted 1,500 cc. of urine in 24 hours after one infusion of 500 cc. of 0.2 percent procaine. McLachlin (8) has used a 0.2 percent solution of procaine administering 500 cc. in 60 to 90 minutes as a substitute for morphine postoperatively after subtotal gastrectomy, pyloroplasty, cholecystectomy, herniotomy, and lobectomy. Relief of pain lasted from 5 to 12 hours after infusion in some patients. When necessary the infusions were repeated every 3 hours. Frequently the pro-

caine outlasts morphine in relief of pain. As an example of some of the more radical procedures carried out with the use of this agent, Allen (9) reported a patient in whom a fractured hip was immobilized with pins using a total of 2.75 gm. of procaine intravenously in 77 minutes. The patient was able to assist himself in getting off the table. Another patient undergoing cholecystectomy was given 4.25 gm. of procaine intravenously in  $1\frac{3}{4}$  hours but with imperfect muscular relaxation (9).

Procaine infusion is not a panacea for the relief of pain, but if judiciously employed is a useful agent.

#### REFERENCES

1. GORDON, R. A.: Intravenous novocaine for analgesia in burns; preliminary report. *Canad. M. A. J.* 49: 478-481, Dec 1943
2. TOVELL, R. M., and BARBOUR, C. M.: Experiences with procaine administered intravenously. *Anesthesiology* 9: 514-523, Sept 1948.
3. FRASER, R. F., and KRAFT, K.: Pentothal-procaine analgesia. *Current Researches in Anesth. & Analg.* 27: 282-286, Sept-Oct 1948
4. GRAUBARD, D. J., and RITTER, H. H.: Intravenous procaine in the treatment of trauma. Read before the American Association for the Surgery of Trauma, Atlantic City, N. J., June 7, 1947.
5. AMEUILLE, P.: La novocaine intraveineuse. *Progr. méd., Paris* 73: 407-413, Dec. 10, 1945.
6. KNIGHT, R. T.: Present developments in combined anesthesia. *J. Michigan M. Soc.* 46: 90-91, Jan. 1947.
7. QUEMARES, J.: Anurles aigues; intraveineuse novocaine. *Thesi méd., Paris*, No. 290, 1946, Abstr., *Ars. Medici* 2: 130-131, Feb 15, 1947
8. McLACHLIN, J. A.: Intravenous use of novocaine as substitute for morphine in post-operative care. *Canad. M. A. J.* 52: 383-386, April 1945.
9. ALLEN, I' M.: New use of procaine; preliminary communication. *Arch. Phys. Med.* 26: 759-761, Dec 1945





intrapleural pressures. The chief causes for weakening of the bronchial wall are atelectasis of the adjacent lung parenchyma and infection of the bronchial wall; atelectasis results in a relative increase in intrabronchial pressure; the bronchi are weakened because of inflammation and loss of the external support.

(c) *Fibrous retraction theory*.—This theory presupposes that bronchial dilatation is due to the traction of adjacent fibrous tissue. This is based on the finding of irregular retraction within the bronchial lumen which occurs where fibrous tissue is abundant.

(d) *Ball-valve mechanism theory*.—This theory assumes a ball-valve mechanism is present, and on expiration the air escapes more slowly thereby increasing the intrabronchial pressure.

The most widely accepted theory is that the obstruction, whether mechanical due to a foreign body or new growth, or due to other factors, gives rise to stagnant secretions and results in anoxia. This favors the growth of bacteria and concomitant inflammatory reaction of the bronchial wall.

#### PATHOLOGY

In the early stages, bronchiectasis is characterized by inflammation; the mucosa is red and velvety in appearance and the bronchial wall is thickened and soft. In most instances the surrounding lung parenchyma is involved in a pneumonic process but areas of abscess formation may also be present. In the intermediate stage the dilated bronchi extend to the peripheral portion of the lung parenchyma and to the visceral pleura and the mucosa appears smooth and gray. In the final stage of bronchiectasis, one or more segments of lung parenchyma contain cylindrically or saccularly dilated bronchi, the walls of which are lined with a smooth, gray membrane; extensive peribronchial connective tissue infiltration occurs. The areas of connective tissues extend from the periphery of the walls of the bronchi into the surrounding lung parenchyma.

The basic change within the wall of the bronchi is that of an acute inflammatory process. At first there is an invasion of the wall of the bronchus by polymorphonuclear leukocytes, fibrin, serum, and red blood cells. The next change is the exfoliation of the epithelium into the lumen of the bronchi; as the inflammation progresses within the wall a progressive desquamation of the epithelial lining occurs. During the acute inflammatory process areas of necrosis may involve the elastic fibers and the muscle bundles. Pressure atrophy of the mucous glands occurs. Subsequently, healing sets in with the appearance of fibroblasts, lymphocytes, collagen fibrils, and dilated capillaries, and the inflammatory process is gradually replaced by a reparative process.

# Bronchiectasis

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**B**RONCHIECTASIS is a dilatation of the bronchi secondary to pathologic changes within their walls. It is primarily a disease of the branch bronchi and is often limited to one or more segments of a lobe.

## ETIOLOGY

Antecedent infections such as primary pneumonia, measles, whooping cough, scarlet fever, influenza, or infection associated with aspiration of foreign bodies are found in the majority of cases. Although the literature on etiologic factors is abundant, an excellent review of the subject is the monograph by Lusa and Rosenblitt (1).

The lower lobes of the right or left lung are involved in the great majority of cases. The incidence, based upon autopsy findings and clinical observations, is about 30 to 1 for the lower lobes over the upper lobes. It occurs unilaterally in about two-thirds of the cases, and is usually limited to one lobe or to one lobe and a portion of another lobe. The lingula of the left upper lobe is frequently involved, particularly when bronchiectasis is present in the lower lobe of the left lung.

The incidence of bronchiectasis at autopsy varies from 0.4 to 5 percent, however, the statistics vary with the type of service reporting. In a large pediatric service the incidence of bronchiectasis will be much higher than in a hospital devoted to treatment of older persons.

There is a slightly higher incidence in men.

The majority of reports indicate that the condition begins in childhood and adolescence and that most patients with the disease do not live to reach the older age groups. It is predominantly a disease of youth.

There are four main theories of the cause of bronchiectasis:

(a) *Neuromuscular theory.*—This assumes that an inflammatory process within the bronchial wall results in a destruction of the nerve supply with subsequent paralysis of the muscle.

(b) *Intrabronchial pressure theory.*—Most workers in physiology believe that there is a great difference between the intrabronchial and

intrapleural pressures. The chief causes for weakening of the bronchial wall are atelectasis of the adjacent lung parenchyma and infection of the bronchial wall; atelectasis results in a relative increase in intrabronchial pressure; the bronchi are weakened because of inflammation and loss of the external support.

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This granulation tissue replaces nerve fibers, mucous glands, muscle tissue, and even cartilage.

If the inflammatory and reparative processes are uniform in all directions then the dilation will be uniform cylindrical bronchiectasis. If, on the other hand, all the wall is not evenly involved, and parts of the wall remain intact, then the dilation appears in circumscribed areas: saccular bronchiectasis.

The bacteriologic finding in the acute case is different from that of long-standing disease. In the acute case streptococci, pneumococci, and staphylococci are ordinarily present if bronchopneumonia is found. In the chronic case, secondary invaders, the fusiform bacilli, spirochetes, various types of staphylococcus, and many other organisms are present; these were formerly thought to be the primary cause of bronchiectasis.

### DIAGNOSIS

The correct diagnosis depends upon: (a) clinical history; (b) physical findings; (c) laboratory findings, especially the sputum examinations; (d) roentgenograms and fluoroscopy; (e) bronchoscopy; and (f) bronchography.

The clinical history usually is indicative of disease in the chest and points to the possible diagnosis. This is easy when there is a history of chronic cough beginning in childhood and aggravated by exercise, laughing, or on change of position, especially on arising in the morning. A history of repeated chest colds or pneumonia is suggestive. In the presence of chronic cough bronchiectasis must be considered (2).

Cough is the outstanding symptom in bronchiectasis. It may be severe, hacking, or persistent and is usually more severe in the morning and aggravated by anything which causes sudden movement of the lung.

Sputum may or may not be foul (only two of our cases had foul sputum), it is usually purulent but may be greenish or blood-streaked. At times the odor of the sputum is so foul and fetid, that the patient is shunned.

Hemoptysis is a prominent point in the history of bronchiectasis as it is commonly present in this disease. A patient who may have been coughing for years will seek medical advice when he sees blood in his sputum.

Dyspnea is usually not a prominent feature of the disease except in the very late stages. However, dyspnea may follow the coughing spasms which occur after exertion.

*Additional symptoms*—Fever occurs when there is poor drainage or when pneumonitis occurred. Gastrointestinal symptoms may follow long bouts of severe coughing. Mild joint pains are occasionally noted and toxic dermatitis has been recorded. General consti-

tutional symptoms such as fatigue and loss of weight may be present. In the severe and long-standing case, right heart failure finally occurs.

#### PHYSICAL AND LABORATORY FINDINGS

The physical findings are frequently minimal, but some abnormal signs can usually be elicited. If bronchiectasis is suspected, auscultation should be done several times a day, and at some time râles may be heard. The râles are usually subcrepitant in character and may be accompanied by rhonchi. The majority of our cases revealed only sonorous or crepitant râles. Dullness to percussion, bronchial breath sounds, and bronchophony may be present over consolidated or organized lung segments. In general the signs depend upon associated parenchymal changes and upon the bronchial content at the time of the chest examination.

In addition to the chest findings, the physical examination may reveal chronic infection of the upper respiratory passages, such as sinusitis or chronic nasopharyngitis. When sinusitis is present the maxillary sinuses are usually involved. Clubbing of the fingers is a classic finding in bronchiectasis. The mechanism of its production is obscure, but a logical explanation has recently been offered by Mauer (6). Lisa and Rosenblatt (7) in their monograph on bronchiectasis state that “\* \* \* there is no direct relationship between the extent or duration of the bronchiectasis and the incidence of clubbing.” In our series, a group of relatively young adults, the patients had had the disease only a relatively short period of time; we found clubbing in only one case. When clubbing is present there are usually other signs which facilitate the diagnosis.

*Sputum studies.*—These are of little value in diagnosing bronchiectasis. Bacteriologic cultures of the sputum aid only in choosing the antibiotic suitable for treatment of the acute episodes. Tuberculosis can be eliminated by bacteriologic studies of the sputum; it should be done routinely in every suspected case of bronchiectasis.

*Roentgenograms.*—The routine chest roentgenogram may suggest bronchiectasis when accentuated hilar marking of the affected side and increased markings extending into the midportions and bases of the lungs are noted. The linear bands, separated by columns of air, ending in club-shaped densities, and the annular shadows described by Andrus (3) were not as frequently associated with bronchiectasis, in our experience, as was invariably present in his cases. Triangular shadows noted in the lower lobes may represent an atelectatic or fibrotic portion of a lobe as a result of bronchiectasis. In our experience one of the best indications of bronchiectasis is delayed resolution of pneumonia or pneumonitis which occurs during a brief (2 or 3 days) illness.

*Bronchogram.*—This is the final diagnostic procedure; it demonstrates the disease, and must be done if surgical therapy is contemplated. The technique is well described in many textbooks and will not be discussed. However, one point needs emphasis: the bronchi should be drained before bronchograms are attempted. This can be done by postural drainage, bronchoscopic aspiration, or by exercises.

Bronchograms should not be done unless bronchiectasis is suggested by the history and physical examination. In pulmonary tuberculosis many believe that the lipiodol can cause spread of the disease. In inflammatory or neoplastic disease, the progress of the disease is obscured by the presence of lipiodol in the peripheral bronchi.

*Bronchoscopy.*—This procedure must always be done in any case of suspected bronchiectasis. This is done preferably before bronchography. Occasionally this procedure will eliminate or demonstrate intrabronchial lesions, neoplasms, or foreign bodies to which the bronchiectasis may be a sequela.

#### SURGICAL TREATMENT

The operative treatment of bronchiectasis has undergone many changes and improvements, but it was not until lobectomy was introduced that hope for cure could be expected. The operative mortality for lobectomy has been reduced from about 60 percent reported as late as 1925, to the present mortality of less than 5 percent. With the low mortality rate, operative treatment can be recommended to nearly all patients with bronchiectasis.

The question naturally arises as to why a patient with a chronic nonmalignant disease should be subjected to an operation that has a mortality rate of about 5 percent. Perry and King (7) in 1940, studied 211 cases and Brulshaw, Putney, and Clerf (8) studied 171 cases of bronchiectasis under medical treatment; the former found that 24 percent died as a direct result of the disease and the latter found 34.5 percent who died from the disease or its complications. The average duration of life after the onset of symptoms was 13½ years, and from the date of diagnosis the average was 1.8 years. These two studies show the advantage of operative removal of the diseased segments.

Prior to 1922 when the use of radiopaque oil for outlining the bronchial tree was introduced by Sicard and Forestier (9), the accurate localization of the disease was difficult. At the present time the diseased segments can be accurately localized and the amount of lung tissue to be removed accurately determined before operation.

*Preoperative care.*—The aims of preoperative care as noted by Maier (10) are: (a) to decrease bronchial and parenchymal inflammation; (b) to decrease bronchial secretions; (c) to decrease virulence and number of existing bacteria, and (d) to improve the patient's general

condition. The routine we follow is based on these principals. An adequate diet is given as indicated by the patient's general condition, and vitamins are prescribed to assure an adequate reserve for the immediate postoperative period. If there is anemia, he is given necessary blood transfusions preoperatively as well as 1,500 cc. whole blood on the day of operation. Postural drainage is done every 3 to 4 hours during the week prior to operation and, in some, moderate exercise is advised to promote coughing. Penicillin aerosol inhalation is prescribed 1 week before and by injection 3 days before operation.

*Operation.*—With the side to be operated upon uppermost and the arm held forward in order to slightly elevate the scapula, a posteriolateral incision is made below the angle of the scapula. The posterior two-thirds of the seventh rib is removed when only the lower lobe is involved, and the sixth rib when the lingula or middle lobe is to be resected. When only the middle lobe is resected, an anterolateral intercostal incision is occasionally used.

The operative procedure followed in the segmental resection, when divisions such as basal division of either side or lingula are to be removed, is fairly well standardized except for minor modifications. The interlobar fissure is dissected down to the hilum. The pulmonary artery and branches to the segments involved are identified, doubly ligated with black silk, and divided.

To approach the veins, the lobes of the lung are all reflected anteriorly and the posterior aspect of the hilum dissected. The upper lobe veins drain into the superior pulmonary vein while the lower lobe veins are tributaries of the inferior pulmonary vein; the veins of the middle lobe on the right and the lingula on the left drain into the superior pulmonary vein. The superior and inferior pulmonary veins usually empty separately into the left auricle. The tributary from the division to be removed is identified by its position of entrance into one of the main pulmonary veins and its course in the lung. The vein is then doubly ligated and sectioned between ligatures.

The bronchus to the portion of the lung to be removed is now fairly free of surrounding tissue. Through and through ligatures are placed on either side of the bronchus approximately one-eighth of an inch from its junction with the main bronchus and tied. A clamp is then placed distal to the ligatures and the bronchus is transected. Tension on the long ends of the ligatures keeps the bronchial walls approximated until an aspirator is introduced into the open end of the bronchus to aspirate any secretions in this area. The cut end of the bronchus is then closed with closely placed interrupted sutures of black silk or fine cotton.

To resect individual segments is sometimes a more difficult problem but to resect the basal division when, for instance, only the posterior

segment of the basilar division is involved is an unnecessary sacrifice of functional nondiseased lung tissue. The method used in such cases is to dissect carefully and to isolate the bronchus to the involved segment; the bronchus is then sectioned and the proximal end closed as noted previously. The artery and vein to the segment involved are not definitely identified or ligated at this time. Traction is placed on the distal end of the bronchus and by blunt dissection, using the fingers as suggested by Clagett and Deterling (11) in their technique for lingulectomy, the hilar portion of the segment is freed. It is found after this that the artery and vein to this segment are well-dissected and free to be ligated without fear of ligating the wrong vessel. When the artery and vein are sectioned, the remainder of the segment can be removed by blunt dissection. There may be several small intersegmental vessels which require individual ligation.

When the involved segments have been removed the closure of the bronchus may be tested by placing normal saline solution in the thoracic cavity to above the level of the bronchus while positive pressure is maintained in the bronchial tree.

Intercostal catheters are then placed in the pleural cavity. One catheter is usually placed low and slightly posterior to remove any fluid accumulation. The second catheter is placed above and anteriorly to suck out air and aid in the reexpansion of the lung. In the wound closure, the pleura and the periosteum of the removed rib are approximated with care to avoid injury to the intercostal nerve and vessels. The catheters are attached to a two-bottle water seal with constant suction and a minimum of 10 to 12 cm. negative water pressure maintained.

Immediate bronchoscopic aspiration while the patient is on the operating table is carried out on all patients with bilateral disease and whenever there is any suggestion of accumulation of secretions in the bronchi.

#### POSTOPERATIVE CARE

Penicillin is administered until the chest is free of fluid and the temperature has been normal for 3 days. Oxygen is used as indicated. The tubes are removed when the lung is completely reexpanded. Fluid which may accumulate after the removal of the tubes is aspirated by needle. Penicillin has been used intrapleurally after the removal of the fluid.

The patient is encouraged to cough following operation; this is of the most important points in postoperative care. It prevents atelectasis in the remaining segments which might occur if the thick secretions were allowed to remain. Clagett (11) reported that 47 per cent of his patients developed atelectasis of the left upper lobe following lingulectomy.

Intratracheal aspiration (Haight technique) in the immediate post-operative period using a fairly stiff urethral catheter has been of great value in preventing atelectasis and has been the instrument used in reexpanding at least four lungs in patients with roentgenographic as well as clinical signs and symptoms of atelectasis. No bronchoscopic examination was necessary in these cases.

*Method.*—The patient is placed either sitting up or lying on his back, with chin elevated as high as possible. The sterile, stiff catheter is introduced through the nostril to the back of the throat. The patient is asked to say "E" several times in order to know its sound and then while the patient coughs the catheter is advanced. There is a definite feeling of free motion as it enters the trachea. If the patient is asked to say "E" now, the difference in sound is immediately apparent because the catheter is between the cords. The catheter may be connected with suction and moved up and down in the trachea. This stimulus to cough is the important part and even if suction is not available the results are good. This method has a very definite advantage in that it can be taught to the nurses in attendance. It is used at frequent intervals, as often as once each hour on occasions.

### RESULTS

We have done 28 operations for bronchiectasis on 23 patients from June 1947 to January 1949. No deaths occurred. All patients except two with bilateral disease were greatly improved as shown by decrease in sputum. Coughing in all patients was lessened, but it was the one symptom which persisted longest after the removal of the diseased segments. Bilateral operations were done in 4 cases.

Portions of lung resected in our series were: right upper lobe, 2; right middle lobe, 6; apex of right lower, 3; basal of right lower, 10; right lower, 1; entire left lung, 1; left upper lobe (apical), 2; lingula, 6; apex of left lower, 1; basal of left lower, 10; and left lower lobe, 1.

In one case the middle lobe and medial and posterior basal segments of the lower lobe on the right side and medial segment of the lingula along with basal segments of the lower lobe on the left were removed. Pneumonectomy was done in one case and either segmental resection or lobectomy was done in the others.

### COMPLICATIONS

Localized and loculated empyema with bronchopleural fistula occurred in four patients; one resulted from the removal of a shell fragment at the time of segmental resection. Three responded rapidly to a short period of intercostal tube drainage. One had a prolonged expectoration of foul sputum. None required reoperation.

Atelectasis of the remainder of lung on the left following removal of basal division and medial segments of the lingula occurred in one patient. This improved rapidly following bronchoscopic aspiration. Spontaneous pneumothorax on the seventh post-operative day with collapse of remainder of lung occurred in one patient. However, the lung reexpanded rapidly with intercostal tube suction. One patient required prolonged suction in order to reexpand the remaining lung.

In one patient because of inadequate localization preoperatively, insufficient segments were removed (as shown on post-operative bronchograms). He has since returned to the hospital stating that he was much improved but continued to have considerable sputum. Reoperation was necessary to remove the remaining diseased lung tissue. This case is an example of operating on a patient without first accurately localizing all the segments in the lobe to be operated on. This is one of the dangers of segmental resection. If there is any doubt repeat bronchograms should be done.

#### REFERENCES

1. LISA, J. R., and ROSENTHAL, M. B. *Bronchiectasis*. Oxford University Press, London 1941.
2. KENNEDY, W. M. Bronchiectasis—a neglected disease. *Dis Chest* 13: 33-38 Jan-Dec 1947.
3. ANDERSON, P. M. Bronchiectasis—analysis of its causes. *Am Rev Tuberc* 36: 46, 1937.
4. ANDERSON, P. M. Radiographic diagnosis of bronchiectasis. *Am Rev Tuberc* 41: 87, 1940.
5. ANDERSON, P. M. Pathogenesis of bronchiectasis. *Am Rev Tuberc* 41: 99, 1940.
6. MAUER, E. F. Etiology of clubbed fingers. *Am Heart J* 34: 852-859 Dec 1947.
7. PERRY, K. M. A., and KING, D. S. Bronchiectasis—study of prognosis based on follow up of 400 patients. *Am Rev Tuberc* 41: 531, 1940.
8. BRADSHAW, H. H., PIERCE, J. J., and CLARK, L. H. Fate of patients with untreated bronchiectasis. *JAMA* 116: 2591, 1941.
9. SICARD, J. A., and FORESTIER, J. Méthode générale d'exploration radiologique par l'huile iodée. *Bull et Mém. Soc. méd. d. hôp. de Paris* 46: 473, 1922.
10. MAUER, E. C. Surgical treatment of bronchiectasis—factors influencing post-operative morbidity and mortality. *Surgery* 15: 5 May 1944.
11. ANWYLL, S. T., and WYCKING, R. A. Technique for segmental pulmonary resection with particular reference to ligulectomy. *J Thoracic Surg* 13: 4 Aug 1946.



# Stevens-Johnson Disease

## Report of a Case

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THE first description of the erythemas as a group is attributed to Willan and Bateman in 1808. Since then the large group of erythema multiforme has undergone many subdivisions. As far back as 1822 Alibert and Bazin (1) described the combination of severe systemic symptoms with the cutaneous lesions of erythema multiforme and involvement of the mucous membranes. In 1866 Von Hebra (2), in his original description of erythema multiforme bullosa, mentioned cases with severe ocular and conjunctival involvement but without severe systemic reaction. In 1916 Rendu (3) described a syndrome characterized by inflammation of the nasal, oral, pharyngeal, and anal mucosae and associated balanitis. Stevens and Johnson (4) in 1922 described what they called a new eruptive fever which was associated with stomatitis and ophthalmia.

A review of the literature shows that the disease which has become known as Stevens-Johnson disease is a combination of the various syndromes described by these authors and others. In all probability, it would be better termed Stevens-Johnson syndrome, a variety of erythema multiforme. This syndrome or disease has been reported under a variety of headings including: erythema multiforme with orificial lesions and systemic manifestations (5); erythema multiforme bullosa; erythema multiforme exudativum (2); ectodermosa erosiva pleuriorificialis (3); and severe erythema multiforme (6).

Essentially, Stevens-Johnson syndrome is a severe systemic disease characterized by ophthalmia, stomatitis, and erythema multiforme lesions of any or all mucous membranes, and the skin; in most cases concentrated in the periorificial areas. These lesions generally follow the stomatitis and ophthalmia in 24 to 72 hours. They may be macular, papular, vesicular, bullous, hemorrhagic, or a combination of these. A broad outline such as this is needed to include all the cases classified as Stevens-Johnson syndrome.

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#### REFERENCES

1. LISA, J. R., and ROSENBLATT, M. B. *Bronchiectasis*. Oxford University Press, London 1943.
2. KINNEY, W. M. Bronchiectasis: a neglected disease. *Dis Chest* 13: 31-38 Jan-Dec 1947.
3. ANDRUS, P. M. Bronchiectasis: analysis of its causes. *Am Rev Tuberc* 36: 46, 1937.
4. ANDRUS, P. M. Radiographic diagnosis of bronchiectasis. *Am Rev Tuberc* 41: 87, 1940.
5. ANDRUS, P. M. Pathogenesis of bronchiectasis. *Am Rev Tuberc* 41: 60, 1940.
6. MAUER, E. F. Etiology of clubbed fingers. *Am Heart J* 34: 852-859, Dec 1947.
7. PERRY, K. M. A., and KING, D. S. Bronchiectasis: study of prognosis based on follow up of 400 patients. *Am Rev Tuberc* 41: 531, 1940.
8. BRADSHAW, H. H., PUTNEY, F. J., and CLIFF, L. H. Fate of patients with untreated bronchiectasis. *JAMA*, 116: 2761, 1941.
9. SICARD, J. A., and FORESTIER, J. Methode generale d'exploration radiologique par l'huile iodée. *Bull et Mem Soc. méd. d. hôp. de Paris* 46: 463, 1922.
10. MAUER, H. C. Surgical treatment of bronchiectasis, factors influencing post-operative morbidity and mortality. *Surgery* 15: 5, May 1944.
11. CROFTT, O. T., and DETMERS, R. A. Technique for segmental pulmonary resection with particular reference to lingulectomy. *J Thoracic Surg* 15: 4, Aug 1946.



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The onset is often characterized by the insidious onset of stomatitis and ophthalmia followed by a severe systemic reaction and the eruptions previously described, but it may be abrupt. Cases are reported preceded by a variety of situations including pharyngitis (7), the ingestion of various drugs (7), severe toothache (8), Vincent's angina (9), chronic dermatitis (10), and the desensitization to caseinogen (11). The manifestations are protean in nature. The temperatures reported vary from low grade to high elevations. The patients' complaints vary from a slight headache to extreme prostration. The eye involvement has been divided into three main groups by Duke-Elder (12): catarrhal conjunctivitis; purulent conjunctivitis; and membranous conjunctivitis. Cases with membranous conjunctivitis are often followed by chronic conjunctivitis. The purulent conjunctivitis is the most severe and may be followed by severe complications such as corneal perforation or panophthalmitis. The involvement of the oral mucous membrane is, with that of the eyes, the most dramatic part of the picture. This may appear as a simple or severe stomatitis, or the involvement may extend down into the oral pharynx or even the tracheobronchial tree. The stomatitis has been reported severe enough to require parenteral feedings for a period of 3 days (5). The lesions in the mouth, and if present, in the pharynx or tracheobronchial tree (13), are generally vesicles which ulcerate and then crust or form a membrane.

The lesions of the skin are of any of a variety of types as previously mentioned. The lesions start as erythematous macules. These are of the iris type. They may proceed to vesicle or bullar formation and occasionally become hemorrhagic. The periorificial concentration of the lesions is often dramatic. The tendency to ulceration may lead to membrane formation over the urethra or rectum, and, occasionally, to the formation of synechia. Urethritis and balanitis are evidence of further involvement of the mucous membrane. A case has been reported with involvement around the fingernails resulting in loss of the nails (14).

The gastrointestinal tract (4) (7), the genito-urinary tract (7), and the mediastinum (15) have been incriminated by the disease process. Lymphadenopathy is a common finding. Splenomegaly is rare. Roentgenograms of the chest frequently show increased peribronchial and perivascular markings. Pneumonia is not uncommon (16). Positive electrocardiogram findings are reported but are probably secondary to the toxemia. The blood counts reported vary from a leukopenia (17) to a leukemoid reaction (5). Eosinophilia is an occasional, but by no means constant, finding. It is of interest to note that while eosinophilia is common in the more chronic allergic conditions, it is infrequent in acute allergic conditions (18).

The syndrome occurs most commonly in the spring and fall. It is more common in the European countries than on this continent. Young men are most often affected but cases are reported in infants of 4 weeks (19) and 1 year (20), and 1 case in a man 52 years of age (21). The proportion of men to women is about 5 to 1.

The syndrome runs a course apparently unaffected by any therapeutic measures. The duration depends on the severity of the individual case. Most often the systemic manifestations and mucosal lesions clear at about the end of the second week and the residual skin lesions clear about 1 week later. One case reported by Fletcher and Harris (21) lasted only 5 days, while a case reported by Kove (22) lasted 86 days, so there is as great a variation in the duration of the syndrome as there is in its manifestations. Recurrences are common.

The cause remains obscure. The protean nature of the disease is very prominent. Whether it is an allergic or anaphylactic reaction to a viral or bacterial infection or other antigen, or if it is actually the manifestation of a widespread systemic infection is in the realm of conjecture. However, the disease presents what we would term an allergic picture with the antigen-antibody reaction unknown. The finding of Vincent's organisms in several cases led to attempts to incriminate these organisms but they could not be found in a significant number of cases. Cultures of the eyes, skin, and mucosal lesions have revealed nothing more than normal flora and the common secondary invaders. The possibility of a viral cause has not been eliminated but the work of the Commission on Acute Respiratory Diseases adequately eliminated the viruses of herpes simplex, vesicular stomatitis, and members of the psittacosis meningopneumonia group (16). Rutter and his group (5) failed to demonstrate the virus of vaccinia or herpes simplex which would exclude these as the causative agent in their case. As previously mentioned, a multitude of variegated precursors to the onset of the syndrome have been reported which will not fit into any definite causal pattern.

The complications following the syndrome hinge in most instances on the severity of the eye involvement. Prior to the advent of the antibiotics, as many as 50 percent of the cases terminated in blindness (23) (8). Other eye complications reported include: symblepharon; conjunctival and/or corneal scarring; perforation of the cornea; and chronic conjunctivitis.

Murphy (24) reported a case in which the glans penis sloughed. Four fatal cases have been reported. Two cases were reported that developed tuberculosis (25); one case developed rheumatic fever within 6 months after clearing of the skin lesions (8).

The treatment is entirely symptomatic, supportive, and preventive. The patient must be maintained in the best possible state of nutrition

and hydration by proper use of parenteral fluids, blood, plasma, and such feedings as can be tolerated by mouth. Specially prepared liquid feeding similar to those used in tube feeding, but more palatable, are of particular value. Every effort must be made to prevent further infection of any of the ulcerated areas. The eyes should be under the care of a competent ophthalmologist if the involvement is severe. If an ophthalmologist is not available the pupils should be kept dilated and penicillin applied locally as an ointment or as drops (5,000 units per cc.), depending on the type of lesion, every 3 hours. The eyes should be kept clean with flushings of boric acid. Dark glasses will add to the comfort of the patient. Penicillin should be given intramuscularly in massive doses every 3 hours.

This general regime has resulted in a definite decrease in the incidence of complications reported. Of 21 cases treated with penicillin and/or sulfadiazine, none resulted in blindness (5) (23) (7) (17) (8). Three had corneal scarring and one a slough of the glans penis. Schoemperlen (26) reported 1 case treated with Benadryl which ran a very benign course, but it is impossible to evaluate any form of treatment in a disease as inconsistent as this, on the results of a single case.

A case characterized by high fever and a leukemoid reaction is reported. The authors believe that the progress of this case was favorably affected by the anti-histaminic drugs and that severe complications were averted by the use of antibiotics.

#### CASE REPORT

A 7-year-old girl was well until about 3 weeks before admission when apparently was bitten by red ants and developed a severe urticarial reaction and each bite which subsided after several days with no adverse results, otherwise her past and family history were noncontributory.

The present illness began with a cold which improved before admission. On 25 December 1948 the child developed anorexia and general malaise and had a temperature of 102° F. The following day she complained of pain in her neck and was unable to turn it from side to side. Her parents then noticed bilateral tumors on the posterior lateral aspect of the neck. The temperature remained between 102° and 103° F. She was seen at the hospital emergency ward with complaints of a sore throat, headache, and a painful neck for which she was given penicillin. The next morning, at the clinic, the patient presented the positive physical findings of bilateral tender tumor masses over cervical nodes with erythema of overlying skin. The physical otherwise negative and her general appearance was good. It appeared to be a typical severe posterior cervical adenitis and the hospital for intensive penicillin therapy.

On admission, 27 December 1948, her temperature 102° F., respirations 20, red blood cell count, 4 million; 1 cell count 21,000 differential, 2 percent juvenile, 2 percent segmented forms, 4 percent lymphocytes, 91 percent monocytes, urinalysis, negative; and blood

revealed no organisms after 21 days. Penicillin, 50,000 units every 3 hours, and elixir of phenobarbital was started. That night the temperature rose to 104.8° F.; this was treated with alcohol sponges and ice water enemas which lowered the temperature to 101.5° F.

On the second hospital day, temperature was 105° F. at 6 a. m. Intravenous fluids, 1,000 cc. 5 percent *d*-glucose in normal saline was given and the temperature fell to 100° but later was again 105.8° F. There were no further changes in the patient's condition except that she developed bilateral nonpurulent conjunctivitis. Sulfadiazine was started at this time due to the poor response to penicillin. The child did not appear as acutely ill as the clinical findings indicated.

On the third hospital day, a red erythematous macular rash was observed around the navel, pubis, vagina, rectum, and on the palms and back. There was a mild stomatitis. Temperature remained between 103° and 105° F. A presumptive diagnosis of Stevens-Johnson disease was made, and the patient was started on Benadryl. Sulfadiazine was discontinued as there had been no clinical response after 24 hours. Fluid balance was maintained throughout by the administration of whole blood, intravenous fluids, and hypodermoclysis. Hyaluronidase was used to increase the absorption of subcutaneous fluids. By the afternoon of the third day the child had developed short periods of disorientation and was complaining of joint pain in her ankles and toes. The erythematous eruptions on the hands and body had become more extensive and confluent. Aureomycin was introduced empirically, 250 mg. every 6 hours. The red blood cell count was 4,200,000; hemoglobin, 12.5 gm.; white blood cell count, 24,500, differential, 1 percent juveniles, 9 percent band forms, 75 percent segmented forms; 13 percent lymphocytes, and 1 percent monocytes; many toxic granules were noted in the polymorphonuclear white cells. Weil-Felix heterophiles, Brucellosis, typhoid, and OX19 agglutinations were all negative.

On the fourth hospital day there was no appreciable change in the physical findings. The eruption seemed more intense in color although no vesiculations were present. The child began to complain of headaches and pain in the lower extremities. No edema or redness of the lower extremities were noted but there was marked tenderness and pain on motion of the ankles. Roentgenogram of the chest showed slight cardiac enlargement and increase in central vascular markings. There was no change in treatment.

On the fifth hospital day the rash was fading; there was no fluctuation of the posterior cervical glands. Mild stomatitis and moderate conjunctivitis were still present. The pain in the lower extremities was more pronounced. The temperature varied between 103° and 105° F. and more frequent periods of disorientation were observed. However, the child still did not appear to be as acutely ill as warranted by the clinical findings. On physical examination there were moist râles over both bases; pulse considerably elevated; temperature 105° F.; and respirations, 40, with slight cyanosis. It was thought that cardiac failure was imminent and that the patient was acidotic. One-sixth molar sodium lactate was given by elysis and she was placed in an oxygen tent. Streptomycin was begun because of the failure of the cervical adenitis to respond to any of the antibiotics and because of the seriousness of the illness. Benadryl was discontinued and Histadyl was substituted as it was thought that the disorientation might have been caused by Benadryl toxicity.

On the sixth hospital day, the rash had almost completely disappeared; however, she continued to complain of severe joint pain; sodium salicylate was started. The streptomycin was discontinued after a 72-hour trial. There was

# Bilateral Dermoid Cysts and Pregnancy

## Report of a Case

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THE following case is presented because of the rarity of this condition and noticeable similarity to one recent reported by Ber-lind (1). He reported a case of bilateral dermoid cyst with a large fibroid of the fundus uteri and intrauterine gestation of 10 weeks. Similarly, a case of bilateral dermoid cysts in a 28-year-old prima gravida with a fundal fibroid and full-term pregnancy is herewith reported.

### CASE REPORT

A routine roentgenogram of the abdomen of a 28-year-old primipara about 5 months before her expected date of delivery revealed an indefinitely outlined cystic mass apparently arising in the vicinity of the left ovary and extending well up it to the left flank. In the lower portion of this mass there was a shadow that appeared to be a molar tooth. Above and a little lateral to this shadow there were other toothlike shadows. On the right a similar mass also containing a toothlike structure was seen. The outlines of a fetal skeleton were also seen (fig. 1). The patient had had no symptoms referable to these tumors and was

unaware of their presence. She proceeded to full term at which time she spontaneously gave birth to a live 7½-pound infant. The puerperium was uneventful and 5 months later she was admitted for removal of the cysts. At this time palpation revealed a rather hard regular ovoid mass about the size of an orange in each lower abdominal quadrant. On pelvic examination a hard tender, fixed cystic mass about 7.5 cm. in diameter was palpated in the right adnexa. The left adnexal region contained a mass of about the same size, almost solid in consistency, freely movable and nontender.

At operation a small fibroid measuring about 1 cm. in diameter was found on the anterior surface of the uterus. Each ovary measured about 6.3 cm. in diameter and was cystic with a very tough capsule. A tooth could be felt in



Figure 1.—Roentgenogram showing bilateral ovarian cysts each containing an opaque mass.

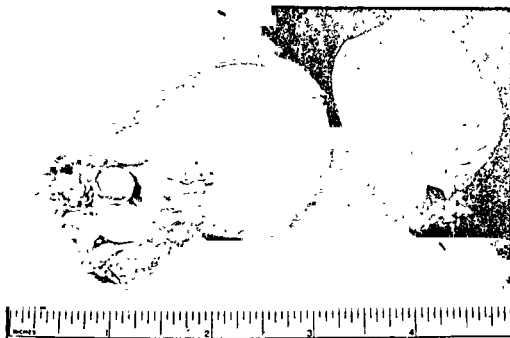


Figure 2.—Appearance of ovarian cysts before section.



Figure 3.—Left ovarian cyst (on left) after section, arrow indicates toothlike structure. Right ovarian cyst after section shows hair and unbroken cyst containing clear fluid.

the wall of the left ovary near its vascular attachment. As this patient wanted to have more children, as much normal ovarian tissue consistent with safety was preserved. On the right side a small amount of ovarian tissue, about one-fifth the size of a normal ovary, was left behind. The cystic mass was shelled away from it without opening the cyst and without leaving any of its capsule. The left ovary was completely involved in the tumor and none of it could be





# Dupuytren's Contracture

## Report of Two Cases

GARLAND A. GRAY, *Captain (MC) U S N*<sup>1</sup>

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DUPUYTREN'S contracture is a disease of the hands in which the gross deformity is thickening and contracture of the fibrous tissue of the palm of the hand. It is prevalent in men and in the aged; it has a strong hereditary tendency; trauma does not seem to play a part in the cause, for statistics show that this condition occurs more frequently in those who do not use their hands strenuously. Bunnell (1) states that in his experience he was impressed by the fact that persons with this condition show a tendency toward limitation of motion in their joints on slight provocation, apparently due to overgrowth, thickening, and contracture of ligamentous tissue. Reichel (2) brings out the interesting hypothesis of the existence of trophic nerves to the palmar fascia, and that as the result of injury to these nerve fibers Dupuytren's contracture results. He cites four cases in which the ulnar nerve was involved in injury or disease with subsequent development of the contracture. This is interesting in view of the fact that the disease is often most pronounced in that part of the hand supplied by the ulnar nerve.

### **PATHOLOGICAL FEATURES**

• Bunnell (1) describes the pathology as follows:

Contracture of a part or all of the palmar fascia and its vertical attachments by proliferation of cicatricial tissue, drawing the proximal and middle joints of the fingers into flexion contracture, puckering in the skin of the palm—especially at the creases—to crescentic, funnel-like depressions and binding down the whole structure tightly to the sides of the metacarpals and the adjoining ligamentous tissue. The greatest proliferation is usually at the level of the distal crease in the palm, and is attached to the proximal margin and sides of the vaginal ligaments encircling the flexor tendons. The short fibers from the palmar fascia to the skin so proliferate and contract that they squeeze out all subcutaneous fat and even the sweat and sebaceous glands and the blood and lymph vessels, so that a thick plaque of tissue forms continuous between the epidermis and palmar fascia. Microscopic cross-section of the skin shows great thickening of the cornified layer, thinning and flattening of the stratum mucosum and obliteration of the papillae

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of the corium, which normally extend up deep in the epidermis. The papillae have been pulled downward and obliquely by the contracting fibers. Descending deeper we see nothing but dense cicatricial tissue which has squeezed out all the fat and deeper structures of the skin. Here and there may or may not be clumps of round cells, suggesting an inflammatory aspect. This tissue is somewhat more cellular and vascular in the early cases, but eventually becomes thick, dense cicatrix. All are fibroblastic. Some are packed with nuclei and in others there is largely intercellular matrix in longitudinal arrangement. From the irritation of repeated attempts to extend the fingers these contracting bands, which are like deep keloids, even microscopically, thicken and contract the more. In places, such as the distal crease in the palm, an area just proximal to the web of the thumb or the volar skin of the proximal segments of the fingers, the cicatrix under the skin may thicken to a solid, broad plaque, strangling out all fat and normal structures and covered by a mere thin layer of epidermis. When a digit remains in flexion contracture all of the tissues in its volar aspect—skin, nerves, joint capsules, etc.—become secondarily contracted, so that even after the palmar fascia and hands are excised the finger cannot be completely straightened.

Meyerding, et al. (3) stress the fact that

Dupuytren's contracture is not merely a disease of the palmar fascia, but involves all structures from the skin down to the tendon sheaths and that the process that involves the skin, subcutaneous tissue, and interstitial connective tissue is an inflammatory reaction marked by proliferation of capillaries and fibroblasts with marked perivascular lymphocytic infiltration. The palmar fascia is remarkable for the fact that within its fibers there is evidence of an active proliferation of fibroblasts without other signs of inflammation. The process progresses through the cycle of fibroblastic proliferation, and then disposition of collagen fibers which contract and compress the fibroblasts and the final picture of a vascular scar tissue result.

#### DIAGNOSIS

*The essential features as quoted by Bunnell (1) are:*

Dupuytren's contracture is so typical that there should be no difficulty in its diagnosis, unless it is present in combination with other conditions in the same hand. The characteristic features are loss of fat between the contracting bands and the epidermis, hard nodules and induration in the skin; transverse skin folds and crescentic puckering, and the arrangement of the contracting cords corresponding with the natural bands of the palmar fascia. There is absence of tendon involvement; the digits can flex completely.

Shortened tendons result in flexion of the distal joints which are, if anything, extended in Dupuytren's contracture. Motions of the digits in tendon shortening will be found to be affected by the position of the wrist joint.

In spastic conditions, unlike Dupuytren's contracture, the proximal joints are usually in extension and the distal two joints in flexion. The other hand, in Dupuytren's contracture, is also usually involved.

#### CASE REPORTS

*Case 1*—A 46-year-old man was admitted complaining of contracture of the fingers of both hands. In 1904 he first noticed a small lump under the skin of the palm of the right hand. This did not disturb him in any way. As time passed the fourth and fifth fingers of the right hand and the fourth finger of

the left hand began to be drawn toward the palms and he was unable to extend them fully. As the fingers were curling, tight cords formed in the palms of his hands. At present he seeks relief because the curled fingers interfere with his handling of tools, and on occasions he is unable to release what he holds in his hands. There has never been any pain or inflammation.

He served in the Navy for 20 years during which time he handled small boats a great deal, and since his retirement he has performed manual labor as a machinist.

His only other complaint is morning cough with profuse mucopurulent sputum.

*Past history*—As a boy he had a severe infection of the left index finger which required surgical drainage. He has not been able to completely extend the finger since then. He had syphilis in 1922 for which he received 2 years of treatment. In 1934 he had gonorrhea complicated by epididymitis.

The family history was irrelevant.

*Physical examination*—The patient was a well-nourished and well-developed 46-year-old white man in apparent good health. The fourth and fifth fingers

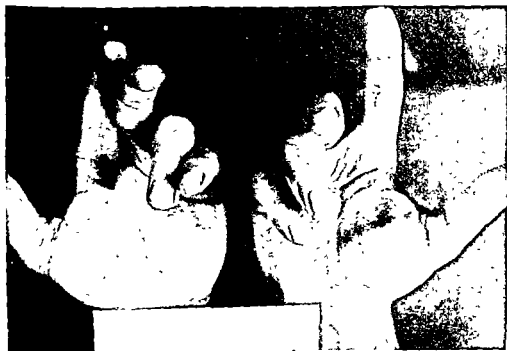


Figure 1.—Limit of extension of the fingers.

of the right hand are held in the position of 50 percent flexion. He is able to fully extend the middle and distal phalanges but extension of the proximal phalanx is limited to 50 percent extension. There is no limitation of flexion. The skin of the palm in the medial half is thin and there are deep pits at the distal palmar crease between the metacarpals and thick, firm, very tense bands of palmar fascia over the third, fourth, and fifth metacarpals. When extension of the proximal phalanges is attempted these bands become more tense. There is nodular thickening of these bands about the distal palmar crease. There is no thickening of the palmar fascial over the first metacarpal, and very little of the second. There is no inflammation, no tenderness, on change or loss of sensitivity. The dorsum of the hand is normal. Circulation is unimpaired.

The left hand presents essentially the same findings in a lesser degree (fig. 1); the index finger has an old scar 4 cm. long along the flexor surface which

Little complete extension. Persistent laboratory examinations were within normal limits. The red-matter rate was 13 mm. 27.

**Operation.**—On 21 July 1948 resection of the palmar fascia of the left hand was done under intravenous sodium pentothal anesthesia. A tourniquet was applied to the arm throughout the operation. An incision was made beginning over the pisiform bone and extending distally over the midpoint of the hypotenar eminence to a point just distal to the distal palmar crease, then coursing laterally over the heads of the metacarpals to the base of the index finger. Only the skin was incised. Small skin hooks were applied to the skin to retract the edges; then by the use of a small-headed scalpel and fine scissors the fibrous bands and thick scar between the palmar fascia and the skin were cut. Where the palmar fascia was most thickened, and especially at the distal crease where the skin was pinched, the skin had to be shaved of longitudinal strands of fascia. The skin flap was dissected and elevated to the extent that the base of the triangular flap was on a line from the pisiform bone to the distal head of the second metacarpal. By the same method the skin from over the head of the metacarpals to the web of the fingers was dissected free and elevated. There was relatively little fat between the most involved part of the fascia and the skin.

The base of the fascia at the bed of the hand was separated from the underlying tendons, nerves, and vessels and severed from its attachment to the palmaris longus tendon. The fascia was then grasped with a Kocher forcep and elevated to make the deep attachments of the fascia to the interosseous fascia fast. These anastomosing attachments were dissected out and severed until the fascia was held only by the bands running down the fingers. These bands were severed at a point as far distally as allowed by the incision. As each major digital nerve and artery was reached the fascial septum running between them and the flexor tendons was trimmed off deep in the hand where it joins the ligaments at the side of the metacarpals and the transverse and vertical ligaments. The palmar fascia was greatly thickened especially over the third and fourth metacarpals. As the fascia was resected the fingers could be freely and completely extended. The thickened fascia over the hypotenar and medial part of the thenar eminences was also trimmed off. The tourniquet was then released. Several small bleeders were grasped and ligated. There was one small burrhole of the skin at the distal crease opposite the fourth finger and the skin was shaved very thin in this area. However, it was considered that this skin had good chance of viability. The skin edges were then sutured in place with multiple interrupted sutures of dermal. The burrhole served as a drainage point.

A voluminous suffed-gauze pressure dressing was applied and the hand supported with the fingers in slight flexion.

**Pathologist's report.**—Gross: The specimen consists of a formally fixed mass of heavy strands of fibrous tissue. It is extremely firm. *Microscopic:* Sections show dense fibrous tissue which is irregular in pattern. There are a considerable number of chronic inflammatory cells. The architecture is distorted by rather intensive fibroblastic and histiocytic proliferation into and around the fibrous bundles. There is considerable edema and hyperplasia of the walls of the blood vessels. Several sweat glands are seen.

**Postoperative course and treatment.**—No antibiotics were given and his temperature remained normal. The first dressing was on the tenth postoperative day at which time the skin flap at the distal medial part appeared devitalized because of poor circulation. Half the sutures were removed and another pressure dressing was applied as well as a splint. At the next dressing the swelling had subsided and good progress with evidence of reestablishment of circula-

tion in the skin flap was noted. The remaining sutures were removed. Daily whirlpool baths, massage, and exercises for the fingers were begun. The hand healed slowly but without interruption. The skin about the distal palmar crease was very thin and fragile. The fingers were rather stiff, especially the fifth finger, but by physiotherapy and occupational therapy the function of the left hand was good enough by 15 September so that the patient could feed and shave himself.

On 30 September 1948 the right hand was operated on. The surgical procedure was essentially the same except that the vertical limb of the incision was placed one centimeter more ulnarward than that on the left hand; also, as the pathological process was somewhat more extensive with considerable thickening of the extensions of the fascia into the fourth finger, a midlateral incision was made over the proximal phalanx and, after location and protection of the digital nerves and vessels, all the thickened fascia was dissected out of this area. As in the left hand the skin flap was shaved very thin in the region of the distal palmar crease, and there were two small buttonholes of the skin. It was again decided that this flap was at least as good and probably better than a split graft so it was sutured in place. A voluminous pressure dressing was applied and the hand splinted with the fingers in slight flexion.

*Postoperative course and treatment.*—Only anodynes were prescribed. The hand was not dressed until the tenth postoperative day. The skin flap looked good although there was about 5 cc of old liquid blood beneath it, which was expressed. The sutures were removed, and the same type dressing and splint applied. Because of the danger of infection of the hematoma, he was given penicillin, 25,000 units every 3 hours. On the thirteenth postoperative day he complained of burning in the palm of the hand. The palm was inspected and it was found that an area of skin about the size of a quarter was elevated at the angle of the incision by a hematoma and was necrotic; the tissue was excised and the hand redressed. The next dressing was done on the twenty-first postoperative day; in the meantime the patient had slight discomfort. At the time of this dressing there was slightly more skin necrosis and a slight inflammatory reaction of the whole distal palm. His temperature had remained normal. The penicillin dose was increased to 50,000 units, however, and warm saline dressings were given twice daily, and whirlpool baths once daily. Under this regime the ulcer gradually became clean and the borders of the ulcer began to epithelialize. On the thirty-eighth postoperative day penicillin was discontinued. By this time the ulcer was almost completely healed, but the midpalm was thickened by organized hematoma and the fingers were very stiff. Physiotherapy was continued daily and occupational therapy begun. On 18 November 1948, the fifty-first postoperative day, the palm was well healed with a complete but thin scar. There was still some stiffness of the fingers but this was much improved. The left hand had almost normal function with only slight stiffness of the fifth finger. He was discharged to his home where he was to continue physiotherapy.

The pathologist's report on the fascia of the right hand was the same as that of the left.

On 14 January 1949, 6½ months after surgery of the left hand, and 3½ months after surgery of the right hand, the patient was seen for a postoperative evaluation. At this time both palms were completely healed but the skin was rather thin and pink. Blanching by pressure was quickly replaced by return of blood. He had full extension and flexion of all the fingers, and they were limber (fig 2). His grip was strong. He was planning to return to his work as a machinist in the next few days.

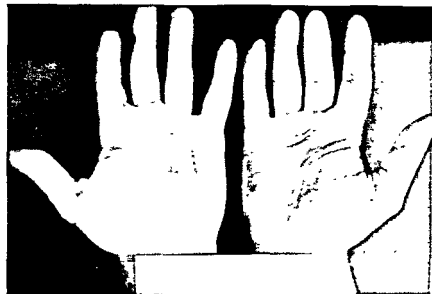


Figure 2.—Appearance of hands 6½ months after surgery on the left hand and 3½ months after surgery on the right hand.

**Case 2.**—This 35-year-old white man was admitted complaining of a nodule in the palm of the right hand of 1 year's duration. After using the hand very much for example, driving his automobile for a long period, there was some pain and fatigue of the hand. When the fingers were hyperextended there was a pulling sensation in the palm. In the past year this nodule has slowly increased in size. There were no other complaints.

**Past History.**—He had had only the common childhood diseases.

**The family history** was noncontributory.

**Social History.**—His work had always been of a clerical nature, and he had not used his hands in such manner to traumatize them excessively.

**Physical examination.**—The patient was a 35-year-old white man in apparent good health. The only significant finding was in the right hand. In the palm of the hand, over the distal head of the fourth metacarpal, is a firm smooth indurately outlined oval tumor mass 1 cm. long and 7 mm. wide and slightly raised above the palmar fascia. Its center is just distal to the distal palmar crease, and at this crease the skin is rather deeply pitted. There is only slight limitation of full extension of the fourth finger, and when this finger is extended as fully as possible a firm wide band in the palmar fascia overlying the fourth metacarpal is outlined. There is no tenderness or apparent inflammation. The middle and distal interphalangeal joints of this finger have full range of motion. The other fingers of the hand also have full range of motion. Except for the pitting over the tumor, the skin of the palm appears normal in texture. The left hand appears normal in all respects.

Laboratory examinations which included roentgenogram of the chest, bleeding time, clotting time, urinalysis, red and white blood cell count, and blood Kahn test were all within normal limits.

**Diagnosis.**—Early Dupuytren's contracture.

*Indications for surgery.*—It was decided to resect the palmar fascia at this early phase of the disease because it is known for its chronicity and progressive-ness, with further deformity and resultant loss of function of the hand. It was also believed that resection of the fascia while it was only moderately involved would be a less difficult procedure than at a later date.

Operation was performed on 6 August 1948. The details of the operation in regard to the incision and the procedure of the resection of the fascia were essentially the same as that reported in the preceding case. However, the lines of cleavage between the fascia and its neighboring structures were difficult to work out and the dissection was tedious and annoying in that the fascia frayed and tore easily when traction was applied to it. The palmar fascia from its attachment to the palmaris longus to its extensions into the third, fourth and fifth fingers was resected. The skin flap was not perforated and was sutured in place with good anatomical approximation. A pressure dressing was applied and the wrist and hand splinted with the fingers in slight flexion.

*Postoperative course.*—On the seventh postoperative day the hand was dressed and the sutures removed. At this time the skin flap looked good except for a narrow zone of devitalization at the distal margin of the skin flap. A pressure dressing and a splint were applied.

*Pathologist's report*—*Gross:* Specimen consists of a formalin-fixed mass which measures 4 cm. in length. It is stringlike at one end and is 0.5 cm. wide at the other end. Cut section reveals rather firm tissue. Microscopic examination reveals a mass of acellular connective tissue with foci of round cell infiltrations and intertwined nerve fibers. No epidermis was present.

*Anatomic diagnosis*—Hyperplasia of palmar fascia.

On the ninth postoperative day the patient complained of a burning pain in the palm of the hand. Examination of the part revealed that a large hematoma had formed under the skin flap. This hematoma was partially organized.



Figure 3.—Appearance of hand on 15 December 1948, 4 months after surgery.



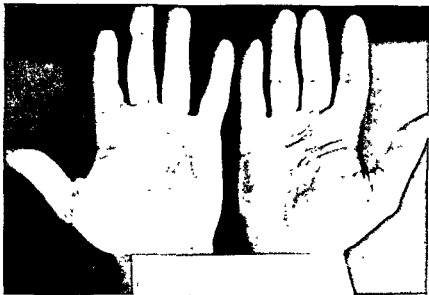


Figure 2.—Appearance of hands 6½ months after surgery on the left hand and 3½ months after surgery on the right hand.

*Case 2*—This 37-year-old white man was admitted complaining of a nodule in the palm of the right hand of 1 year's duration. After using the hand very much, for example, driving his automobile for a long period, there was some pain and fatigue of the hand. When the fingers were hyperextended there was a pulling sensation in the palm. In the past year this nodule has slowly increased in size. There were no other complaints.

*Past History*—He had had only the common childhood diseases.

The family history was noncontributory.

*Social History*—His work had always been of a clerical nature, and he had not used his hands in such manner to traumatize them excessively.

*Physical examination*—The patient was a 37-year-old white man in apparent good health. The only significant finding was in the right hand. In the palm of the hand, over the distal head of the fourth metacarpal, is a firm, well circumscribed, but not sharply outlined oval tumor mass 1 cm. long and 7 mm. wide and slightly raised above the palmar fascia. Its center is just distal to the distal palmar crease, and at this crease the skin is rather deeply pitted. There is only slight limitation of full extension of the fourth finger, and when this finger is extended as fully as possible a firm white band in the palmar fascia overlies the fourth metacarpal is outlined. There is no tenderness or apparent inflammation. The middle and distal interphalangeal joints of this finger have full range of motion. The other fingers of the hand also have full range of motion. Except for the pitting over the tumor, the skin of the palm appears normal in texture. The left hand appears normal in all respects.

Laboratory examinations which included roentgenogram of the chest, ECG, blood-clotting time, urinalysis, red and white blood cell count, and Kahn test were all within normal limits.

*Diagnosis*—Early Dupuytren's contracture.

*Indications for surgery.*—It was decided to resect the palmar fascia at this early phase of the disease because it is known for its chronicity and progressive-ness, with further deformity and resultant loss of function of the hand. It was also believed that resection of the fascia while it was only moderately involved would be a less difficult procedure than at a later date.

Operation was performed on 6 August 1948. The details of the operation in regard to the incision and the procedure of the resection of the fascia were essentially the same as that reported in the preceding case. However, the lines of cleavage between the fascia and its neighboring structures were difficult to work out and the dissection was tedious and annoying in that the fascia frayed and tore easily when traction was applied to it. The palmar fascia from its attachment to the palmaris longus to its extensions into the third, fourth, and fifth fingers was resected. The skin flap was not perforated and was sutured in place with good anatomical approximation. A pressure dressing was applied and the wrist and hand splinted with the fingers in slight flexion.

*Postoperative course.*—On the seventh postoperative day the hand was dressed and the sutures removed. At this time the skin flap looked good except for a narrow zone of devitalization at the distal margin of the skin flap. A pressure dressing and a splint were applied.

*Pathologist's report.*—GROSS: Specimen consists of a formalin-fixed mass which measures 4 cm. in length. It is stringlike at one end and is 0.5 cm. wide at the other end. Cut section reveals rather firm tissue. Microscopic examination reveals a mass of acellular connective tissue with foci of round cell infiltration and intertwined nerve fibers. No epidermis was present.

*Anatomic diagnosis.*—Hyperplasia of palmar fascia.

On the ninth postoperative day the patient complained of a burning pain in the palm of the hand. Examination of the part revealed that a large hematoma had formed under the skin flap. This hematoma was partially organized.



Figure 3.—Appearance of hand on 15 December 1948, 4 months after surgery.



*Figure 2—Appearance of hands 6 1/2 months after surgery on the left hand and 3 1/2 months after surgery on the right hand.*

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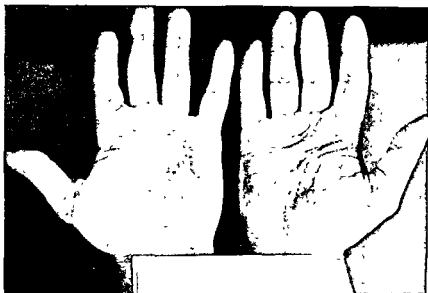


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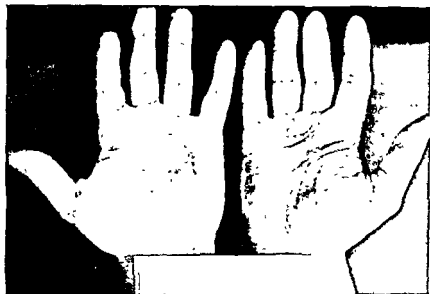


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The family history was noncontributory.

*Social history*—His work had always been of a clerical nature, and he had not used his hands in such manner to traumatize them excessively.

*Physical examination*—The patient was a 33-year-old white man in apparent good health. The only significant finding was in the right hand. In the palm of the hand over the distal head of the fourth metacarpal, is a firm smooth indefinitely outlined oval tumor mass 1 cm long and 7 mm wide and slightly raised above the palmar fascia. Its center is just distal to the distal palmar crease and at this crease the skin is rather deeply pitted. There is only slight limitation of full extension of the fourth finger, and when this finger is extended as fully as possible a firm wide band in the palmar fascia overlying the fourth metacarpal is outlined. There is no tenderness or apparent inflammation. The middle and distal interphalangeal joints of this finger have full range of motion. The other fingers of the hand also have full range of motion. Except for the pitting over the tumor, the skin of the palm appears normal in texture. The left hand appears normal in all respects.

Laboratory examinations which included roentgenogram of the chest, bleeding time, clotting time, urinalysis, red and white blood cell count, and blood Kahn test were all within normal limits.

*Diagnosis*—Early Dupuytren's contracture.

involvement of the fascia and loss of function of the hands, the greatly hypertrophied tissues were technically easier to remove. It may be well to wait until the disease has progressed to an incapacitating degree, but before permanent shortening of the other tissues of the hand has occurred, before advising surgery.

#### REFERENCES

1. BUNNELL, S.: *Surgery of The Hand*. 4th edition. J. B. Lippincott Co., Philadelphia, Pa., 1944.
2. REICHEL, P.: Trophic nerves and Dupuytren's contracture. *Chirurg.*, Wurtzburg 17: 18-97, Dec. 1946. Abstract: *J. A. M. A.* 136: 286, Jan. 24, 1948.
3. MEYERDING, H. W.; BLACK, J. R.; and BROOKES, A. C.: Etiology and pathology of Dupuytren's contracture. *Surg., Gynec. & Obst.* 72: 582-590, March 1941.
4. SKINNER, H. L.: Dupuytren's contracture; operative correction by use of tunnel skin graft. *Surgery* 10: 313, Aug. 1941.
5. PALMER, L. A., and SOUTHWORTH, J. L.: Bridge operation for Dupuytren's contracture. *Am. J. Surg.* 68: 351-354, June 1945.





Further treatment consisted of the administration of penicillin, 50,000 units every 3 hours, and daily dressings with the expression of some clot from the hematoma each time.

No gross infection occurred. The distal third of the skin flap became devitalized and was excised as it became detached. By the thirtieth postoperative day most of the hematoma was extruded or absorbed and the defect of the palm began to slowly heal. From the twenty-first postoperative day he received daily whirlpool baths and exercises for the fingers.

By the fortieth postoperative day there remained an ulceration the size of a quarter, slight localized swelling of the palm due to organized unabsorbed clot, and some stiffness of the fourth and fifth fingers. At this time he was discharged with instruction for taking physiotherapy at home.

On 15 December 1948 he was seen again at which time there was still some thick scarring of the palm, the skin was healed with a wide scar at the point of skin devitalization (fig 3), but he had full range of motion of all the fingers and he was asymptomatic.

### COMMENT

In two of the three hands in this series the postoperative course was complicated by hemorrhage in the palm following the removal of the skin sutures, in one case on the seventh postoperative day and on the tenth postoperative day in the other. This resulted in devitalization of part of the skin flap in each case, but with eventual satisfactory healing. It may be well not to remove the sutures until about the fifteenth postoperative day. Because of the predilection for fibrosis and shortening of joint capsules in these patients physiotherapy was instituted by the third postoperative week notwithstanding the previously mentioned complication.

In the hands where there was thinning and pitting of the palmar skin, this skin was shaved very thin and buttonholed in removing all the fibrous tissue. In the future it may be wise to employ the method recommended by Skinner (4) in grafting this part of the skin defect. After resection of the palmar fascia and suturing of the skin flap, Skinner places one or two "tunnel grafts," which are narrow split thickness grafts placed transversely under the thinned-out palmar skin, usually at the palmar creases. The original, devitalized skin overlying these grafts sloughs or is excised in about 2 weeks.

Some surgeons (5) advise, in instances such as case 2 where the disease is grossly limited to one segment of the fascia, resection of only that grossly diseased part with its overlying skin, and filling in the defect with a split thickness graft.

Resection of three palmar fascias is too limited an experience from which to draw conclusions, but we were impressed with the relatively greater difficulty in resecting the fascia of the second patient whose fascia was only moderately involved and who had little disturbance of function of the hand. Although the first patient had extensive

involvement of the fascia and loss of function of the hands, the greatly hypertrophied tissues were technically easier to remove. It may be well to wait until the disease has progressed to an incapacitating degree, but before permanent shortening of the other tissues of the hand has occurred, before advising surgery.

#### REFERENCES

1. BUNNELL, S.: *Surgery of The Hand*. 4th edition J. B. Lippincott Co., Philadelphia, Pa., 1944.
2. REICHEL, P. Trophic nerves and Dupuytren's contracture *Chirurg*, Wurzburg 17: 18-97, Dec 1946 Abstract: J. A. M. A. 136: 286, Jan 24, 1948
3. MEYERDING, H. W.; BLACK, J. R.; and BRODERS, A. C.: Etiology and pathology of Dupuytren's contracture. *Surg., Gynec. & Obst* 72: 582-590, March 1941.
4. SKINNER, H. L.: Dupuytren's contracture; operative correction by use of tunnel skin graft. *Surgery* 10: 313, Aug. 1941
5. PALMER, L. A., and SOUTHWORTH, J. L.: Bridge operation for Dupuytren's contracture. *Am J. Surg* 68: 351-354, June 1945.



# The Long-Cuff Endotracheal Tube

## Its Manufacture and Use

RALPH T. KNIGHT<sup>1</sup>

ARTHUR B. TARBOW, Major, U S A. F. (MC)

THE long-cuff endotracheal tube has been used at the University of Minnesota since 1942 (1). It was developed to solve the problems of vocal cord and tracheal irritation which follow lengthy use of the endotracheal tube. It proved so useful that it was adopted for all operations in which a complete tracheal air seal and bronchial cleanliness was deemed essential.

During the month of July 1949, 218 surgical procedures lasting from 15 minutes to 10 hours and 25 minutes (averaging 2 hours and 50 minutes per case) were carried out at the University of Minnesota Hospital; in this series, 138 patients were intubated.

There were several reasons for this large number of intubations. Besides the surgical operations in the chest and abdomen, which obviously required the use of endotracheal tubes, it was believed wise to intubate patients scheduled for such surgical operations as radical mastectomy and cholecystectomy. These patients might have been anesthetized and surgery done without an endotracheal tube but endotracheal intubation was done to insure adequate respiratory exchange and to permit access for free removal of tracheal and bronchial secretions during the long operating periods. The use of a combination of intravenous pentothal-curare and inhalation nitrous oxide-oxygen (in 81 cases) made it advisable to augment the respirations in order to obtain perfect oxygenation.

The long-cuff endotracheal tube is best inserted by the oral route because it is somewhat bulky for passage through the nose. However, when advisable it can be so inserted (2). The correct size endotracheal tube for each patient is determined before intubation by placing endotracheal tubes of varying lengths alongside the patient's neck in the

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natural curve. The tube which reaches to the suprasternal notch, approximately 4 or 5 cm. from the coryna is used. When inflated to 16 cm. water pressure, the cuff adapts itself to the trachea, vocal cords, and hypopharynx, resulting in a soft, cushion seal of the vocal cords from above and below (fig. 1).

The cuff, manufactured from commercial condoms, is deflated every 15 to 30 minutes to prevent any possibility of vocal cord compression. However, 16 cm. water pressure causes little tension. When no manometer is available the cuff may be inflated by blowing into the inflating catheter until air will not leak around it when the breathing bag is compressed manually.

After each use the endotracheal tube is washed inside and out with soap and water. It is then soaked in a germicidal solution such as aqueous Zephiran chloride for 1 hour.

There are several disadvantages to the use of this type of cuff. Endotracheal intubation may be more difficult because of obstruction to vision by the bulky cuff in the restricted area of the hypopharynx. Another difficulty is that the cuffs are relatively fragile and must be replaced periodically. Some cuffs may last for only four or five uses and others many times this number depending on the manner in which the intubation is handled, the method of washing and soaking, the type of solutions used, and the care with which they are stored between uses. Waters (3), experimenting with long cuffs, found that the tube had a tendency to be drawn from the trachea when the pharyngeal portion was inflated.

These disadvantages are relative. The anesthesiologist quickly becomes accustomed to intubating with the more bulky tube. The cuffs can be replaced so easily and for such little cost, that loss of a cuff causes no difficulty. Sanders (4) is manufacturing an excellent long cuff of durable material, modeled after that of Grimm and Knight (1). However, for those who wish to manufacture large numbers of cuffs for endotracheal tubes of various sizes and shapes, the condom is readily available. When the cuff is long enough, it has been found that the tube will not be drawn out of the trachea. The various

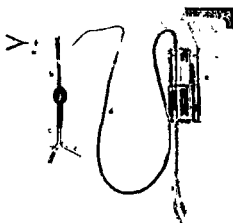


Figure 1.—The long-cuff endotracheal tube in place. (a) Adam's connector to anesthesia machine; (b) endotracheal tube, 23 cm. long; (c) model of trachea and main bronchi (18 mm. in diameter). The endotracheal tube extends to within 4 cm. of the coryna; (d) tubing from (e) water manometer to inflating catheter.

shapes, sizes, and materials available commercially are illustrated in figure 2. They are:

(a) Commercial rubber endotracheotomy tube. This is made with a Magill angle and placed within the trachea after removal of the entire tracheotomy apparatus. The outside diameter corresponds to Lundy No. 6, Magill No. 9, and French No. 33.

(b) Commercial rubber tube, 16 cm. in length, for use in children 6 to 10 years of age. The outside diameter of this tube corresponds to Lundy No. 4, Magill No. 4, and French No. 26.

(c) Commercial rubber tube, 21 cm. in length, for use in small women or large children. The outside diameter corresponds to Lundy No. 5, Magill No. 6, and French No. 28.

(d) Portex tube, 23 cm. in length, for use in the average adult man or woman. The outside diameter corresponds to Lundy No. 6, Magill No. 9, and French No. 33.

(e) Forreger rubber tube, 23 cm. in length, with same dimensions as (d).

(f) King-Magill rubber tube No. 9, 23 cm. in length, with universal adaptor connectors. The dimensions are the same as (d).

(g) King-Magill rubber tube No. 10, 30 cm. in length, with a short cuff and universal adaptor connectors. The outside diameter corresponds to Lundy No. 6 and 7 and French No. 37. This tube is useful in intubating animals.

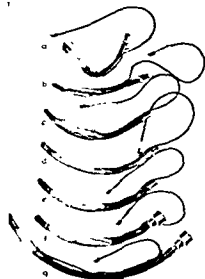


Figure 2—Variations in shapes, sizes, and materials of the long-cuff endotracheal tube

We found that an important advantage in the use of this type of cuff was the relative absence of pathologic vocal cord changes despite lengthy use. In addition, not a single case of tracheal ring or tracheal mucosa irritation has been reported since the change from the usual small commercial cuff (1) (3). Another advantage is that the long cuff seals the vocal cords from above. This insures a clear trachea in case of regurgitation of gastric contents. At the end of any procedure the pharynx is always cleansed as completely as possible, and careful tracheal toilet carried out to remove any other secretions and to assure an airway free from foreign material post-operatively.

## THE MANUFACTURE OF THE TUBE

The following equipment is needed to manufacture long-cuff endotracheal tubes: (a) condoms; (b) rubber tubing. "Davol" rubber laboratory tubing has been found to be the best obtainable for this purpose. Size  $\frac{3}{16} \times \frac{1}{16}$  (No. 2610) is used for making Lundy No. 4 tubes; size  $\frac{1}{4} \times \frac{1}{16}$  (No. 2615) is used for making Lundy No. 5 tubes; size  $\frac{5}{16} \times \frac{1}{16}$  (No. 2619) is used for making Lundy No. 6 tubes; (c) French No. 8 catheters; (d) small Penrose drains; (e) rubber cement; (f) "Miracle cement" (obtainable in any hardware store); (g) scissors; (h) sandpaper; and (i) talcum powder.

As noted in figure 3, the steps in the manufacture of the long-cuff endotracheal tube are as follows:

(a) A tube of the desired length is cut from stock tubing. For Lundy No. 6 or Magill No. 9 size, the length usually should be 23 cm. However, lengths of 21 to 22 cm. are also cut to insure an individualized fit for various-sized patients. Length for Lundy No. 5 or Magill No. 6 varies from 19 to 21 cm. Length for Lundy No. 4 or Magill No. 4 is usually 15 to 16 cm. Tubes

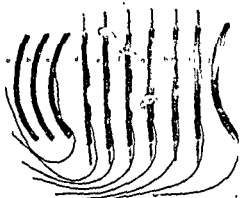


Figure 3.—Steps in the manufacture of the long-cuff endotracheal tube.

of various sizes and shapes may be cut at one time because it is just as easy to manufacture several at once as to do each separately.

Any type of tubing material may be used. The cuff may be applied directly to commercial tubing, Forreger rubber tubing, or Magill tubes. However, in order to apply cuffs to Portex tubes, a tight 1 cm. circle of Penrose drain must first be applied to the tube at the beveled end because rubber cement will not stick to this plastic material. The procedure is the same thereafter.

(b) One end of the tube is beveled to an angle of  $45^\circ$ . All tubes used at the University of Minnesota are beveled to the left; i. e., the beveled edge faces the laryngoscope when intubating. It is believed that this allows for greater visualization and facility. This bevel may be smoothed by sandpapering. Another method of smoothing the bevel is to hold it over a flame until the rubber begins to burn. Quickly wiping this charred surface with a cloth dampened with noninflammable chloroform will leave the surface smooth. The addition of a little talcum powder overcomes any sticky residual effects. One can smooth a dozen tubes in five minutes with the chloroform method.

(c) A cut of 1 cm. is made in the flared end of a French No. 8 catheter. This flare is then flattened and attached to the concave curvature

of the tube about one-third of the way from the beveled end by means of a circlet of Penrose drain and rubber cement. Another circlet of Penrose drain is rolled over the unbeveled end to hold the catheter out of the way during manufacture and use.

(d) Long, wooden applicators such as are used in sigmoidoscopic examination are forced into the lumen of the tube until it remains straight and rigid. This assists in the application of a tight cuff. "Miracle cement" is placed around the catheter about two-thirds of the way from the beveled end (in figure 3, represented in white for contrast). It is allowed to dry for 20 minutes, after which it may be shaped around and over the catheter. The purpose of this puttylike cement is to fill and seal the crease between the tube and catheter. It also serves to bulwark the thinwalled French No. 8 catheter so that it will not be compressed when this end of the cuff is sealed around it with tight binding. The tube is put aside for 24 hours to allow the cement to harden completely. (The portion of the tube with the hardened cement never enters the vocal cords but remains in the hypopharynx.) When this cement has hardened, the anesthesiologist has the basic tube. Torn condoms may be replaced, using this basic tube over and over again.

#### THE CUFF

(e) A hole, 1 to 2 mm., is punched in the end of a rolled condom. A drop of water-soluble jelly is applied to the bevel. By pinching the bevel and stretching the condom, the tube can be squeezed through this narrow hole. It is pulled 3 cm. from the beveled end, and then rolled back toward this end so that the surface of the tube may be moistened by rubber cement for a distance of  $1\frac{1}{2}$  cm.

(f) The condom is then rolled back over this sticky surface and molded until a tight seal results.

(g) Rubber cement is ringed around the tube at the level of the "Miracle cement." The condom is stretched tightly in pleats and fastened here. The excess condom is cut off.

(h) A tight binding of strips of condom is wound and cemented in layers at this point. Talcum powder is dusted over this area to eliminate stickiness.

(i) A circlet of Penrose drain is slipped over the unbeveled end of the tube and cemented to this area to doubly insure a tight seal and to prevent the strips of condom from unwinding when soaking the tubes after use.

(j) Connectors are attached at the unbeveled end. (Adams connectors are shown (fig. 3).) The point of a 15 gauge needle is filed off and the needle inserted into the free end of the French No. 8 catheter.

As seen in figure 1, the cuff may be inflated by water manometer, which is also easy to manufacture. The essential feature of any such manometer is that the cuff is inflated by the pressure of the weight of 16 cm. of water (figs. 4 and 5).

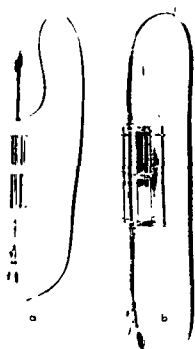


Figure 4.—Water manometers.

(a) A type of manometer with inside copper tubing (fig. 4). This simple form of manometer was suggested by S. Ross Melgaard, formerly of the anesthesiology staff at the University of Minnesota. Such manometers are relatively fragile because the water containers are made of glass. By encasing the glass in a wood frame or by strips of rubber, this hazard may be reduced. The manometer shown here is still in use after several years of careful handling.

(b) The latest type of manometer (fig. 5), made by drilling into a block of lucite, a plastic material.

Note that in figure 1, the water is in the upper chamber when the cuff is inflated. In figure 4, with the manometer not in use, the water drops into the lower chamber.

The use of water manometers was suggested by Dr. Clarence Dennis, Professor of Surgery at the University of Minnesota, following a case of severe tracheal irritation which followed the employment of a

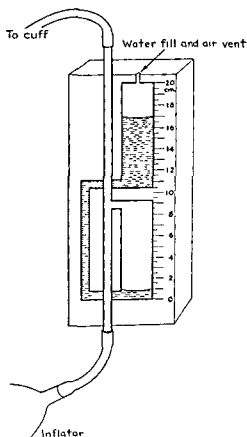


Figure 5.—Cut-away representation of the lucite manometer.



short commercial cuff. The cuff used in this case was overinflated by blowing into the inflating catheter.

#### SUMMARY

The long-cuff endotracheal tube has been used during anesthesia in 138 patients. It has been shown to have an important advantage over other tubes in that it will not produce pathologic vocal cord changes or evidences of tracheal mucosa irritation despite long use. It seals the vocal cord from above and insures a clear trachea in case of regurgitation of gastric contents and thus permits in obtaining an airway free from foreign material postoperatively. The steps in its manufacture are described.

#### REFERENCES

1. GRIMM, J. E., and KNIGHT, R. T. An improved intratracheal technique. *Anesthesiology* 4: 6-11, Jan. 1943.
2. GILLSPIE, N. A. Endotracheal Anesthesia. University of Wisconsin Press, Madison, Wisc., 1948.
3. GILLSPIE, N. A. University of Wisconsin Hospital, personal communication.
4. SANDEN, R. D.; Delaware Hospital, Wilmington, Del., personal communication.
5. LENNON, B. B., and ROVENSTINE, E. A. Fatality following rupture of inflatable cuff on endotracheal airway. *Anesth. & Analg.* 18: 217-220, July-Aug. 1939.



# Experiences With the Marrow Nail Operation According to the Principles of Kuentscher<sup>1</sup>

## Gunshot Fractures of the Femur

### PART V<sup>2</sup>

PROF. DR. C. HAEBLER

THE mortality rate in gunshot fractures of the femur was high (10 percent); there were five fatal cases, three of which were treated outside our clinic. One death was caused by improper treatment of the wound infection, another was caused by fat embolism, and a third and fourth from operative shock.

One patient who died from operative shock had a 4-month-old fistulous gunshot fracture. A roentgenogram revealed several sequestra. On the third day, after the administration of 3 cc. of evipal, circulatory and respiratory collapse occurred and surgery was postponed. Fourteen days later it was necessary to stop a blood transfusion because of nausea and labored breathing. After that all treatment was jeopardized by the occurrence of severe vasomotor instability. Treatment of the general circulation for 3 weeks prior to the operation permitted the patient to withstand the removal of six large sequestra without special difficulty, but when the connective tissue scars of the fragments were mobilized his pulse rate rose to 140. In spite of this, nailing was performed. Circulatory collapse occurred and he did not respond to infusions and heart stimulants which were administered during the operation. The patient died 9 hours after the operation. Post mortem revealed fatty degeneration of myocardium and liver and anemia, but no fat embolism.

There is no doubt that the nailing caused the death in this case. The nailing of a femur fracture is a major operation, no matter how smooth its performance may be. This fact must be borne in mind especially in fractures due to gunshot injuries.

<sup>1</sup>Translation prepared by the U. S. Naval Technical Unit, Europe (Medical Section), Office of Naval Advisor, Office of Military Government (U. S.), edited by U. S. Naval Medical Bulletin.

<sup>2</sup>Parts I to IV were printed in the U. S. Naval Medical Bulletin beginning with the May-June 1949 issue.

A fifth case had no connection with the marrow nailing operation. This patient had a year-old chronically infected compound fracture of the femur in which a 3-cm. long tubular sequestrum had developed. The knee and hip joints had stiffened considerably. Repeated attacks of renal colic and large numbers of leukocytes in the urine indicated the formation of calculi in the left kidney, but no stones could be found.

Because of atrophy of the bone, the nailing was performed only as a last attempt to save the limb. The patient, an active officer, insisted on having the operation performed. The osteosynthesis was stable in the beginning, but the nail loosened very soon so that rotary movements of the distal fragment became possible. A large decubitus ulcer over the sacrum and an empyema of the knee joint were observed 4 weeks after the operation; the decubitus ulcer did not heal regardless of treatment. The general condition of the patient became worse, so the limb was amputated at the thigh 8 weeks after nailing. The patient recovered at first, but later we observed abscesses, septic hemorrhages, and an infection of the hip joint. After a resection of the hip joint the general condition of the patient improved and the decubitus ulcer healed, but 8 months after the nailing a nephrectomy was performed because of a pyonephrolithiasis. Four weeks later erysipelas spread from the stump of the thigh and the patient died.

Although the marrow nailing was not directly the cause of death, it is probable that the infection of the knee and hip joints would probably have been avoided if the nailing operation had not been performed; there is no doubt that the irritation which was caused by the nailing was responsible for the subsequent infection of the stiffened joints.

It must, therefore, be concluded that the nailing operation of an infected fracture should not be performed if the joints have stiffened. Mobilization of the joints in the course of the operation cannot be avoided, and this only increases the danger of infection.

A survey of the cases of nailed gunshot fractures of the femur that were observed by the author until the removal of the nail is given in table 9. In the first column is included fractures, the wounds of which had been healed for over 9 months and which also would have been suitable for other methods of osteosynthesis.

All fractures came to a bony union, and this is certainly a good result. That fistulae formation and sequestra will take place in infected fractures is a matter of course and will occur in much the same way in conservative methods. However, an infection of the marrow cavity can definitely be avoided by using the conservative methods. If the nail constitutes a hazard it should not be used.

TABLE 9—*Marrow nailing in old gunshot fractures*

	Number of cases	Bony union	Accompanied by	
			Formation of sequestrae	Osteomyelitis
.....	8	8	3	1
.....	5	5	2	1
.....	4	4	1	1
.....	4	4	2	2
Pseudarthroses 8 to 18 months old, with wounds healed for 3 to 5 months.....	3	3	1	1
Old fractures 6 to 14 weeks old, wounds healed for 6 weeks.....	19	19	10	1
Old fractures, 1½ to 12 months fistulating.....	7	7	7	1
Old fractures, 4 to 12 weeks purulent.....	45	45	22	3
Total of fractures, the wounds of which were healed after less than 6 months or were still purulent.....				

<sup>1</sup> Formation of sequestrae of 1 case after removal of nail

<sup>2</sup> Formation of sequestrae after removal of nail

<sup>3</sup> Perforation of the point of nail, para-articular abscess after removal of nail

<sup>4</sup> Formation of sequestrae of 3 cases after removal of nail

Figure 84a is a roentgenogram of a 4-month-old femur fracture that united in faulty position; the wounds had healed after 2 months. The osteosynthesis was stable. The wounds had been primarily sutured without drainage and when infection developed the surgeon waited 5 days before opening the wounds widely, consequently the purulent secretions followed the path of the nail which acted as a drain and finally infected the marrow cavity. Figure 84b is a roentgenogram made 4 months after nailing; osteomyelitis had developed in the fracture cleft and in the proximal fragment.

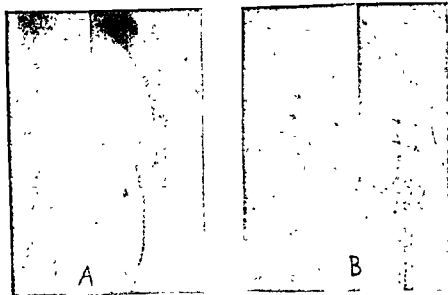


Figure 84.

In an 8-month-old pseudarthrosis in the distal third of the femur (the wounds had been healed for more than 5 months) a primary suture was applied. The osteosynthesis was only relatively stable in this case. The nail found a grip in the spongiosa of the distal fragment (fig. 85a) and the patient was allowed to use the limb 9 days after the operation. A week later, a collection of pus in the adjacent tissues was drained. Eight days later the wound secretion became purulent and fever set in. When the wound was finally inspected (29 days after the operation) the roentgenogram (fig. 85b) showed osteomyelitis and periosteal deposits. An abscess developed in the wound at the trochanter and a gravity abscess and an osteomyelitis, which spread as far as the subtrochanteric areas, developed, which necessitated (even after the removal of the nail 3½ months later) several sequestriectomies. The final result after treatment for more than 2 years was a stiff knee joint.

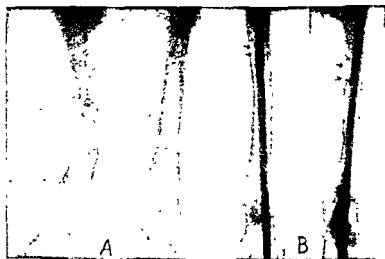


Figure 85.

The nailing operation cannot be blamed for the poor results in the previously mentioned case; unsuitable treatment and improper technique were responsible. The fixation of the fracture would have been possible by conservative treatment. The report of the operation states "with a view to reducing the fragments and of driving the marrow nail in the distal direction, it became necessary to separate the fracture cleft widely, which was not easy to perform. Although the fracture is not solid we observed considerable masses of callus at the posterior part of the cleft." Impatience of the surgeon (and of

the patient) influenced the indication in this case. This impatience is confirmed by other facts; osteotomy, because of faulty position, was justified and correctly performed, then a plaster cast was applied, additional fruit diet, vitamin C, and diathermy were given "because the callus formation was only slight after 5 weeks." The plaster cast was removed after 8 weeks and a Volkmann's splint applied. Diathermy was then used and the patient was given calcium, C-Bion, and massage because "more properly, although the fracture was still movable." As could be expected the fracture came to a posterior angulation of the distal fragment. The limb was left on the Volkmann splint and the fracture was immobilized with a sand bag (a measure which is never of any use). Three months after the osteotomy, Beck's drilling was performed and the limb put in a walking cast 4 weeks later. When the roentgenogram did not reveal enough callus 4 weeks later it was "considered whether a marrow nail might bring the necessary fixation and stimulate the formation of callus. The nail could, at the same time compensate the antecurvation." If the walking cast had been applied after osteotomy or the antecurvation had been corrected under anesthesia and the walking cast left in position long enough, the fracture would have united quicker and with better results.

The delayed opening of the wound was responsible for the spread of the infection into the marrow cavity. This is confirmed by the localization of the osteomyelitis which developed in the proximal fragment where the least mechanical counterpressure is (in the path of the nail toward the soft parts) above the trochanter. It did not spread into the distal fragment because the spongiosa and bone mantle offered no outlet.

The reaction is different if the nail does not have a firm hold in the bone. The nail will then permit tilting movements when the limb is used and will force or suck the infected secretions into the empty spaces. This was observed in an osteotomy nailing of an 11-month-old gunshot fracture, the wounds of which had healed 10 months prior to the operation. A drain was inserted and the limb put in a plaster cast. A decubitus ulcer formed on the heel; this was incised and 2 weeks later the fracture became infected.

This reaction was also observed in the osteomyelitis of an 8-month-old fracture of the femur in which the nail did not obtain a firm hold. The patient, whose wounds had been healed for 6 months, was admitted because of a faulty position, "absence of callus, and imminent pseudarthrosis." It was decided to nail this fracture by the open method, although clinically the fracture had solidified to a considerable extent. The necessity of removing most of the transversely located bone splinters which would cause considerable shortening was

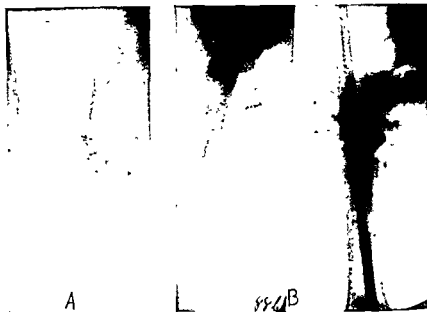


Figure 86 a and b.

overlooked, and on roentgenogram checking of the medium-size nail in position (fig. 86a) the author failed to notice that the distal marrow cavity was too wide for the nail.

The nail was driven in as far as the spongiosa of the epiphysis so at first the fracture was fixed (fig. 86b).

The wound was drained and closed but had to be opened shortly after the operation because of a venous hemorrhage. The vessel could not be located so the wound was tamponed. The primarily closed wound of the trochanter was not opened. A dorsal plaster splint extending up to the pelvis was applied, and a week later when the tampon was removed there was little secretion from the wound and the patient's temperature was normal.

Six weeks after the operation the patient had a fever; an abscess at the wound of the trochanter was widely opened. Soon after, an abscess was noted at the fracture cleft from which metal splinters and sequestra were removed. The limb was placed in a plaster cast after which the patient's fever subsided, but there was still a purulent discharge especially from the wound of the trochanter. This subsided very slowly.

Six months after the operation the patient's temperature rose again and he complained of pains above the knee joint. There was no effusion into the joint. The roentgenogram (fig. 86c) showed, in addition to a loosening of the structure next to the point of the nail, a

distinct rarefaction; therefore the limb was elevated, and the wound opened widely. After this was done the patient's temperature returned to normal.

When the purulent secretions had stopped, treading exercises in bed were begun but had to be stopped immediately because of pain at the fracture site and a rise of temperature. Three weeks later an abscess above the knee joint had to be opened; the joint was not involved and no rough bone was palpable. The rarefaction at the point of the nail did not increase, but distinct periosteal deposits were noticed along the medial side of the distal fragment (fig. 86*d*).

As the bone was obviously solid the nail was removed 8 days later. Sequestra were removed repeatedly from the fracture cleft and the healed wounds broke open several times. The patient was discharged from the hospital 17 months after the operation. The final result (fig. 86*e*) was a 9 cm. shortening of the limb, a stiffening of the knee joint, and a 50 percent impediment in the mobility of the hip joint.

This fracture should never have been nailed. Mobilization under anesthesia with wire extension and plaster cast would have been better. The fracture would have united quicker and much of the shortening would have been avoided.

It must always be borne in mind that when treating comminuted fractures the shortening will be greater if nailed than it would be if conservative treatment is used.

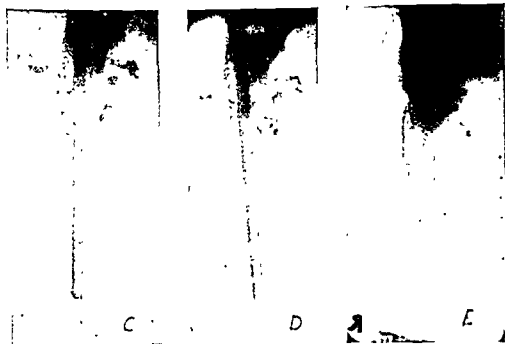


Figure 86 *c, d, and e.*



When infection occurs it is imperative to open the wound widely and to elevate the leg so that no accumulation of pus can take place in the distal fragment. The knee must be higher than the operative wound and the wound at the trochanter.

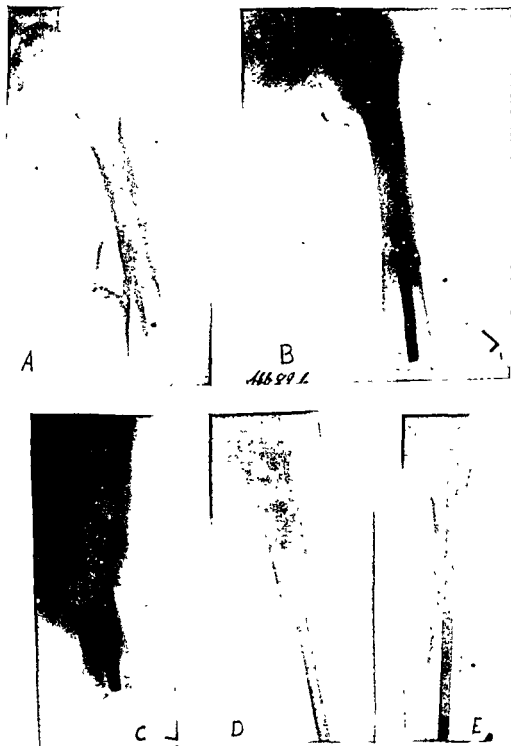
The author has suggested that the leg be kept in a horizontal position after the operation so that the drain becomes the deepest point; he has refused to use Braun's splint because with its use the wound at the trochanter would be the lowest point and the wound secretions could follow the nail in an upward direction. This is not true because the knee is generally in a lower position, especially if a dorsal plaster splint or a plaster cast in extended position is applied. In every case the knee must be kept in a higher position.

Figure 87*a* is a roentgenogram of a 10-month-old gunshot fracture of the left femur. When the patient was admitted the wounds had been healed for 3 months, but the fracture was still movable. As the right leg had been amputated it was not necessary to take a shortening into account so the proximal fragment was resected to the extent that the fracture could be easily reduced. The nail was driven into the spongiosa in order to secure a firm hold; the wounds at the fracture and trochanter were drained and the leg placed in a pelvic plaster cast. Four weeks after the operation the fracture was clinically solid (fig. 87*b*) and the wounds had healed; the plaster cast was removed and reading exercises in bed begun. Two weeks later the patient had fever and the wound at the fracture site broke open. A large abscess was discovered at the fracture site. This was caused by the loosening of the nail. Figure 87*c* shows rarefactions, lined by a distinct margin, next to the point of the nail.

The secretion subsided after the limb was put in a position of rest for a while. Exercises were again started but the patient's temperature rose immediately and there was an increased discharge of pus. A roentgenogram (fig. 87*d*) made 3 months after the operation showed a distinct formation of callus. Movements of the limb were then performed without pain and without causing inflammation of the wounds. Six weeks later (6½ months after the operation) the nail was removed. Figure 87*e* shows an irritation next to the rarefaction at the point of the nail. This rarefaction was due to mechanical influence because the limb was always put at rest and elevated in time to prevent an accumulation of pus in the distal fragment.

The following case illustrates a serious mistake; attention was always focused on the fracture cleft and no attention was paid to the point of the nail.

Figure 88*a* shows a 3-month-old compound gunshot fracture. It was in poor position and showed little formation of callus. Removal of the sequestrum and the nailing operation were done in one session.

*Figure 87.*

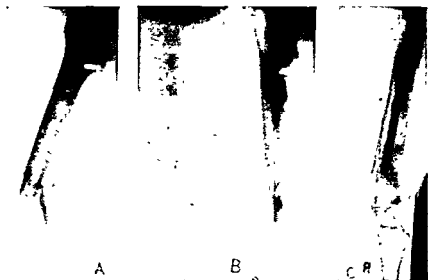


Figure 88 a, b, and c.

Because of the wide distal cavity the nail was driven into the spongiosa (fig. 88b) to obtain a relatively stabile osteosynthesis. Drains were inserted at the trochanter and the limb placed in a plaster cast. The patient's temperature returned to normal and the purulent discharge subsided soon after. The plaster cast was replaced by a plaster splint 4 weeks after the operation. The roentgenogram (fig. 88c) showed a distinct dystrophy of the condyles of the femur and a very subtle rarefaction next to the point of the nail, which we overlooked. Four weeks later several abscesses developed. These subsided when the limb was placed in a pelvic plaster cast.

A sequestrum was removed from the fracture site 6 months after nailing; the fracture was bridged over by callus (fig. 88d) so the plaster cast was removed. A purulent discharge still persisted 7 months after the operation so the nail was removed and the leg put in a plaster splint and kept in a horizontal position.

Two months after the removal of the nail a para-articular abscess was opened; rough bone was palpable above the lateral condyle and a perforation on the external side was noted (fig. 88e). This perforation was still visible on a roentgenogram made 4 months later (fig. 88f) when the path of the nail was barely noticeable and the fistulae were closed.

The patient was discharged from the hospital 13 months after the operation. The fracture had united without shortening but the knee joint had stiffened considerably. The bones at that time were still

dystrophic and the site of the perforation was barely recognizable (fig. 88g).

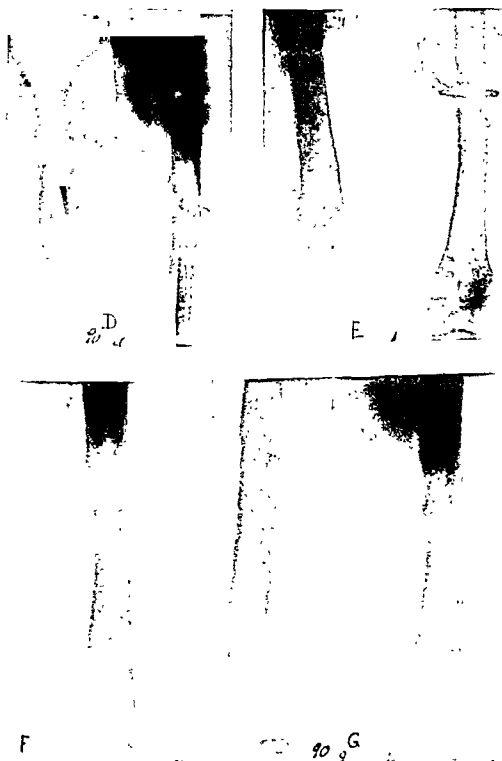


Figure 88 d, e, f, and g.

The point of the nail is seen only in one of the roentgenograms (fig 88c) and that is probably due to a coincidence. When comparing illustration 88b and 88d it becomes evident that the nail had moved laterally and its point had probably pierced through the bone. The leg should have been elevated after the removal of the nail so the pus could have escaped through the bed of the nail thus probably preventing the spread of the infection.

Osteomyelitis was avoided in the two preceding cases because the limbs were put in plaster casts. Osteomyelitis is not to be feared if the

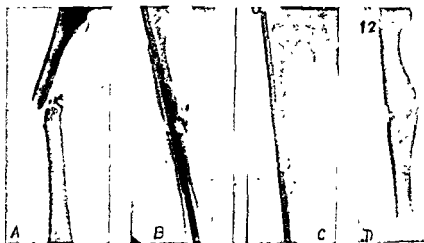


Figure 89

nail has a firm hold and if the wounds are opened widely at the onset of infection.

An example which shows that the nail does not constitute a hazard in case of an infection of the wound and that the nail does not cause the spread of infection into the marrow cavity and also into the fracture cleft if the wounds are widely opened in time is shown by the following case.

A 6-month-old fracture (fig. 89a), the wounds of which had healed after the first wound treatment. An unsuccessful attempt to correct the position under anesthesia was made 8 weeks after the accident. Abscesses formed and there was a tedious secondary healing. Eight days after the wound healed a nailing osteotomy was performed because the fracture had solidified to a considerable extent. The wounds were primarily sutured but had to be opened 4 days later because of intense swelling. No pus was found. The fracture was in correct position but there was a gap of about 1 cm. at the fracture cleft (fig 89b). Two weeks later the wound had healed without irritation and the patient began to use the limb so the fragments could be pushed

together. Eight days later the old fistula broke open again; it was enlarged and the secretion lasted for some time but there was no ejection of sequestra.

In spite of this, the limb was used without pain but the gap in the fracture still remained. A roentgenogram made 3 months after the operation (fig. 89c) showed a slight loosening of the structure at the fracture cleft, a cloudy formation of callus, but not an osteomyelitis. The nail was removed 6 months after the operation and the fistula still showed a slight secretion. After the removal of the nail the fistula healed.

An attempt to mobilize the knee joint, which was stiff before the operation, was unsuccessful.

The patient was discharged from the hospital 8 months after the operation. The fracture showed a bony union without shortening (fig. 89d), and the defect was completely bridged over (Boehler denies such a possibility), the hip and ankle joints were freely movable, and the knee joint was movable by  $10^{\circ}$ .

Postponing the operation in cases of fractures united with angulation does not reduce the chances of infection. In addition, restoration of normal conditions are more difficult because the callus is probably solid and this increases the chances of infection. The author believes (if the limited number of his patients warrants such conclusions) that the incidence of infection is higher in osteotomies performed later than 9 months after healing of the wounds than in those operated earlier. This is especially true in pseudarthroses of old fractures. The explanation is probably that the wounds were not sutured in operations performed shortly after healing.

The poor results of nailing operations have intentionally been given so much space because only by mistakes can we learn and thus come to perfection. Sincerity serves the cause and the patients more than a list of successful operations because this might lead the beginner to underestimate the difficulties.

The results obtained by the marrow nail operation are superior to any other method: all fractures, including pseudarthroses a year or more old, will unite provided the osteosynthesis is stable.

One instructive example will be given in this connection.

A gunshot fracture of the left femur sustained on 27 December 1941, was first treated by removal of numerous splinters and the limb put in an extension bandage for 5 months. In March 1942 an osteosynthesis by use of a Lane's plate was done but this had to be removed 3 weeks later because infection occurred. An extension bandage was again applied and kept on until June 1942 when the leg was put in a pelvic plaster cast. In October 1942 a fixation was attempted by means of ivory pins but the wound became infected again.

The gunshot wounds had been closed since February 1942 but no bony union developed.

In June 1942, when the patient was readmitted, the wounds were healed but there was abnormal mobility at the fracture site, a shortening of 6 cm., the knee was stiffened in an extended position, and the patient could walk only with a hinged splint (fig. 90*a*). On 8 July 1942 a marrow nailing operation was performed with exposure of the fracture site. The ivory pins and remnants of wire were removed and the callus resected as sparingly as possible. A drain was placed in the approximation sutures and the leg put in a splint. Osteosynthesis was stable (fig. 90*b*) and the wounds healed. On 15 July, 1 week after the operation, the patient started exercises of the knee joint and on 8 September he was discharged from the hospital. The patient walked well without limping with a high heel shoe and the roentgenogram (fig. 90*c*) showed a distinct formation of callus and no rarefactions at the point of the nail.

The fracture pushed together and the nail pushed out at the trochanter. On 7 March the fracture had united (fig. 90*d*) and the nail, which had pushed farther upward, was removed. The patient was discharged from the hospital 10 days later. The patient's stay in the hospital after the nailing operation was 73 days; unemployability, 123 days.

The course, the duration of stay in the hospital after the marrow nailing, and unemployability correspond in every respect to what is known in the nailing of fresh fractures; the same was true for all other aseptically healed cases.

In smooth transverse fractures, shortenings could be avoided in all cases, and the same is true with regard to impediments of the joint in fractures 3 months old or less. If the joints had stiffened before the operation considerable improvement was achieved in all cases with an aseptic course. The shortenings in osteotomies were greatly improved in all cases. These are results which cannot be obtained by any other method.

Unfortunately the author had no opportunity to use penicillin but he feels that the use of this drug will greatly reduce the danger of infection in the treatment of fractures by the open nailing.

It is not always possible to determine whether an osteosynthesis will become stable or not and it is dangerous to wait: especially if the bone tends to unite in bad position. If it becomes evident during or after the operation that only a relatively stable osteosynthesis will be obtained by driving the nail in as far as the spongiosa of the epiphysis, it will be necessary to put the limb in a plaster cast immediately. If infection develops the fixation must be maintained until the fracture has reached an advanced degree of solidification.

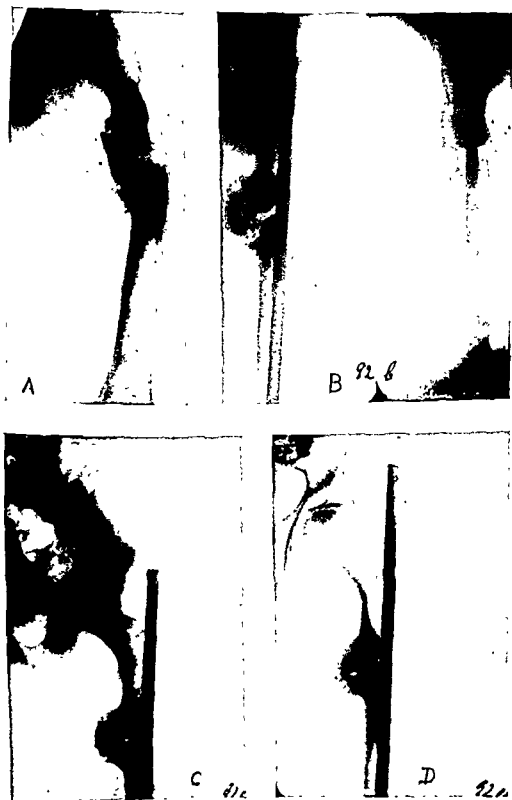


Figure 90 a, b, c, and d.



The gunshot wounds had been closed since February 1942 but no bony union developed.

In June 1942, when the patient was readmitted, the wounds were healed but there was abnormal mobility at the fracture site, a shortening of 6 cm., the knee was stiffened in an extended position, and the patient could walk only with a hinged splint (fig. 90a). On 8 July 1942 a marrow nailing operation was performed with exposure of the fracture site. The ivory pins and remnants of wire were removed and the callus resected as sparingly as possible. A drain was placed in the approximation sutures and the leg put in a splint. Osteosynthesis was stable (fig. 90b) and the wounds healed. On 15 July, 1 week after the operation, the patient started exercises of the knee joint and on 8 September he was discharged from the hospital. The patient walked well without limping with a high heel shoe and the roentgenogram (fig. 90c) showed a distinct formation of callus and no rarefactions at the point of the nail.

The fracture pushed together and the nail pushed out at the trochanter. On 7 March the fracture had united (fig. 90d) and the nail, which had pushed farther upward, was removed. The patient was discharged from the hospital 10 days later. The patient's stay in the hospital after the nailing operation was 73 days; unemployability, 125 days.

The course, the duration of stay in the hospital after the marrow nailing, and unemployability correspond in every respect to what is known in the nailing of fresh fractures; the same was true for all other aseptically healed cases.

In smooth transverse fractures, shortenings could be avoided in all cases, and the same is true with regard to impediments of the joint in fractures 3 months old or less. If the joints had stiffened before the operation considerable improvement was achieved in all cases with an aseptic course. The shortenings in osteotomies were greatly improved in all cases. These are results which cannot be obtained by any other method.

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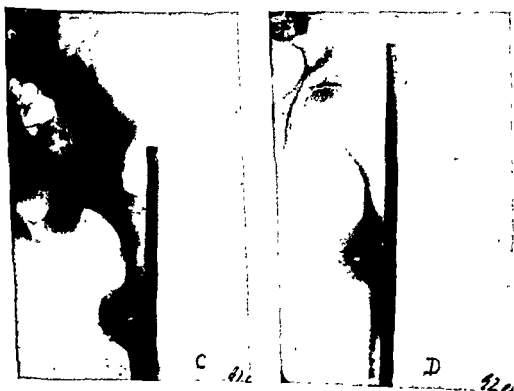
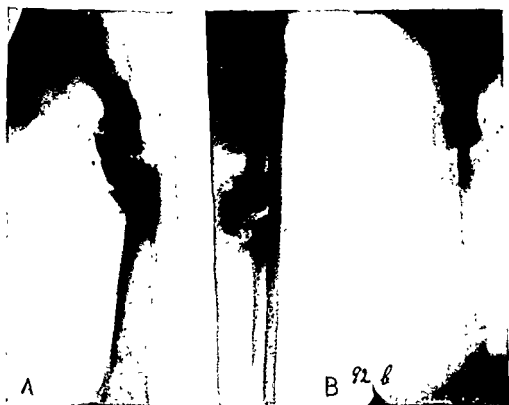


Figure 90 a, b, c, and d.

If no infection develops it will be necessary to check the patient closely for 6 to 8 weeks after the operation, as this is the time when the nail will begin to loosen in the spongiosa. This condition is indicated by rarefactions next to the point of the nail. If the patient complains of the slightest pain or if swelling occurs, immediate bed rest is imperative. This must be strictly observed because of the possibility of infection and all its complications.

The advisability of nailing while the wounds are still discharging pus would depend on whether or not the nail would spread the infection. This, generally, is not the case, as was demonstrated by the fact that osteomyelitis did not occur in any compound chronically infected fractures treated by the author, including a fistulous fracture of the femur in which the nail was driven into the knee joint. Although an irritation was observed in the knee joint, this condition disappeared in 3 days.

As improbable as it may seem, the infection is obviously wiped off the smooth surface of the nail upon entering the scar tissue which closes the marrow cavity. If any infection is spread it will be so slight that the marrow cavity, with its great number of blood cells, can easily cope with it. This mechanical cleansing seems to be almost perfect if the nail enters through solid bone. The center of infection is held up by a dam of granulations as soon as the acute stage is overcome. If this granulation is pierced by the nail it will close again in a very short time, thus affording full protection, provided the nail has a firm hold.

Because of these facts the author endeavored to avoid resection of the fracture ends and severance of the periosteum. He adopted the same procedure as in closed nailing, driving the nail in from the trochanter and not from the fracture cleft as is customary in open nailing. When the nail reaches the fracture cleft the fracture is properly reduced (traction by an assistant is usually sufficient) and the nail or guide rod is directed into the distal marrow cavity with the finger which is introduced into the wound. This method offers no difficulties in fractures of the tibia and humerus, but in fractures of the femur conditions are more difficult and this painstaking is worth while. By following this procedure subsequent formation of sequestra was avoided. Whenever the nailing was performed from the fracture cleft, and especially if the fracture site had been widely exposed, the patient had fever and a chronic infection with formation of sequestra persisted.

If it is decided to nail a fistulous fracture that has united in faulty position the operation should be performed in two sessions: first an osteotomy (refracture) of the fracture and extension fixation until acute sequelae are overcome; then, if these measures are not satisfac-

tory as to reduction and fixation, and only then, the nailing may be performed, but not earlier than 3 weeks after fever has disappeared.

We have nailed seven chronically infected femur fractures because of the formation of sequestra, abscesses, or pneumonia, and the impossibility of fixation regardless of position. Only in such emergencies do we advocate stabile osteosynthesis with the marrow nail. The perfect fixation which can be achieved with the nail has shown surprisingly good results in fighting infections and improving the general condition of the patient. This is shown in the following case.

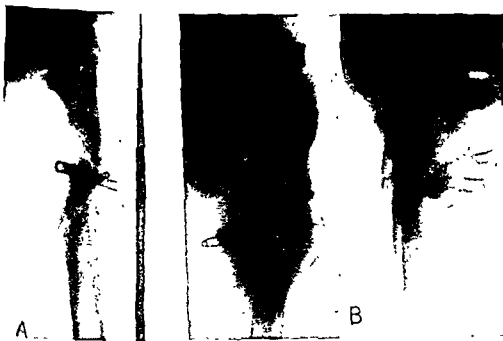


Figure 91 a and b.

Several abscesses had been opened in this 43-day-old fracture of the femur and the patient still had a fever of  $40^{\circ}$  C. The wire extension did not prove satisfactory because the patient was very nervous (fig. 91a). As we had been able to separate a few loose splinters from the wound it was decided to nail the fracture. The palpable splinters and sequestra were removed without opening the wound very wide. The guide rod was then introduced into the proximal marrow cavity, under roentgenogram control, after placing several needles for guides (as is done in closed marrow nailing), after which the nail was driven in. When the nail had entered the marrow cavity about 6 cm. the guide rod was removed and the nail driven in until it could be felt at the fracture cleft. The nail was then directed with the finger and could be easily introduced into the distal fragment after appropriate reduction was made by an assistant. The nail was then driven into the spongiosa of the epiphysis which gave it a firm hold

(fig. 91b). The operative site and the trochanter wounds were then drained (the former posteriorly) and the limb was kept in a splint in a slightly elevated position.

The patient still had a fever the day following the operation, but 5 days after the operation his temperature returned to normal and he was free from pain. Recovery was rapid but the wound infection persisted for 4 weeks. After that the infection subsided and 8 weeks after the operation the patient started moving the limb. After 3 months he was ambulatory. Several abscesses were opened later and 6½ months after the operation a sequestrum the size of a cherry seed was removed, and the secretion ceased.

A roentgenogram made 3 months after the operation (fig. 91c) showed good callus formation so the limb was subjected to weight bearing.

Nine months postoperatively the nail was withdrawn, although a fistula was present. The leg was again put in a splint for 2 weeks; several sequestra were ejected and the fistula closed. The patient was then discharged from the hospital. The hip and ankle joints were freely movable and the flexion of the knee was up to 60°.

Six months later the patient fractured the patella of the same leg; this was fixed by wire suture.

The shortening of the leg amounted to about 9 cm., about 50 percent of which was compensated for by special footwear. Hip and ankle



Fig. 91 c and d.

joints were free; flexion of the knee  $80^{\circ}$  to  $180^{\circ}$ ; and the patient was able to walk without a cane. The fracture united with no formation of cavities or sequestra (fig. 91*d*).

The sound leg will be shortened at some future time, using the marrow nail.

The advocates of conservative treatment may maintain that the fracture would have united without the use of the nail, but the marrow nail meant an alleviation of pain and it appears doubtful whether such good mobility of the joints would have been obtained by conservative treatment. More than one-third of the gunshot fractures of the femur treated by Boehler had a mobility of the knee joint of less than  $60^{\circ}$ .

Of chronic infected fistulous fractures, 6 healed without any impediment; in 3 cases there was more than  $90^{\circ}$  mobility of the knee; in 3 the fractures united without shortening; 2 had shortening of 1 cm.; and 3 comminuted fractures united with shortenings of from 3 to 6 cm. Only 8 cases came in for treatment earlier than  $2\frac{1}{2}$  months after injury (a time when existing impediments of joints seems to be reparable).

In the remaining 18 cases of compound fistulous fractures of the femur the injuries dated back 5 to 12 months. After such a long time it was impossible to restore full mobility to the joint, but definite improvement was achieved in all of these cases.

The time spent in the hospital can hardly serve as a basis for comparing the value of the marrow nail method with the conservative method because this depends entirely on the type of fracture. In cases treated by the author, the time varied between 180 and 450 days. It was surprising that the stay in the hospital was particularly long in fractures that had been opened widely and in which the guide rod or nail had been introduced from the fracture cleft. These cases were characterized by abscess and sequestra formation.

A compound chronically infected fistulous fracture in good position as shown in figure 92*a* should not be nailed. This fracture was  $7\frac{1}{2}$  months old and the roentgenogram showed a distinct callus formation. Fixation would have been just as quick by using conservative methods and in all probability the shortening of 2 cm. and impeded abduction of the hip joint and limited mobility of the knee which resulted from the nailing would have been prevented.

Although the nail had a firm hold in the distal fragment (fig. 92*b*) the osteosynthesis was not stable enough to permit early use of the limb. Another reason why the limb could not be used early was because sequestra continued for a long time. Ten months after the operation the fracture had healed enough to remove the nail, and 3 months later the fistulae were closed (fig. 92*c*).

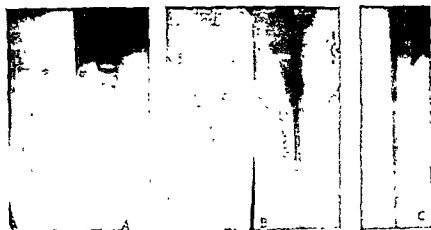


Figure 92.

If an ordinary Unna's extension bandage had been used, instead of nailing, better results would probably have been obtained with less delay. It is therefore not advisable to nail compound fistulous fractures that are in good position with callus formation; but if the position is bad and there is danger of a faulty union, as was the case in a 5-month-old infected fracture shown in figure 93*a*, marrow nailing should be done.

In this case sequestra and shell fragments were obviously the reason for infection, therefore exposure of the fracture was necessary. After removal of the sequestra the fracture was completely movable and a roentgenogram (fig. 93*b*) showed a threatened pseudarthrosis. The infection ceased soon after the operation and the general condition of the patient improved. His temperature was normal 4 weeks post-operatively and motion of the limb was started. A small sequestrum was ejected later and 5 months after the operation the fracture had united to such extent that the patient began to use the limb (fig. 93*c*). The nail was removed 3 months later (fig. 93*d*) and the fistula soon closed. Two small sequestra were ejected later. The final result was a shortening of 4 cm. (the limb was 8 cm. short before the operation), 50 percent impediment in abduction of hip joint; and 100° to 180° mobility of the knee joint.

From experiences and knowledge gained from the preceding cases the author draws the following conclusions:

If an old gunshot fracture of the femur has united in bad position, nailing osteotomy is indicated and should be performed as soon as possible provided a stable osteosynthesis can be obtained.

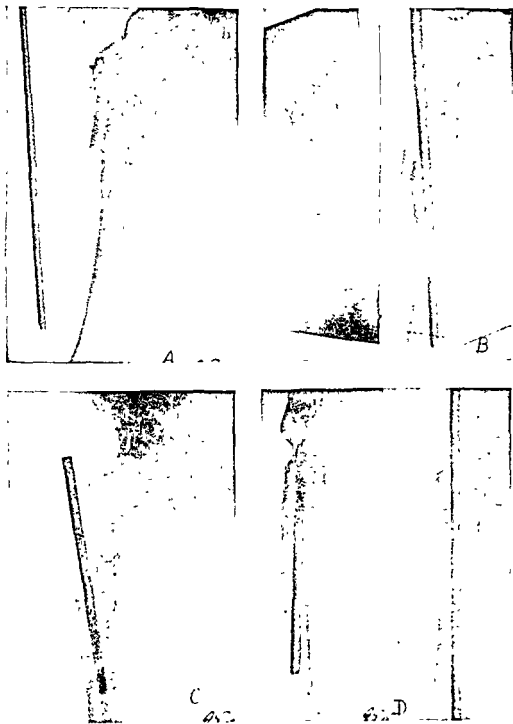


Figure 93 a, b, c, and d.



# Spontaneous Rupture of the Spleen in Relapsing Fever

CLARENCE W. LEGERTON, *Captain, MC, U. S. A.*  
WALLACE L. CHAMBERS, *Captain, MC, U. S. A.*

**C**LINICALLY, rupture of the spleen may be considered as either spontaneous or traumatic. The latter may be further divided into rupture of a healthy spleen and rupture of a spleen revealing pathologic changes. A review of the literature fails to reveal any authoritative reports of spontaneous rupture in a healthy spleen. This conclusion is supported by Lundell's (1) study of 20 cases designated as spontaneous rupture of a healthy spleen; none of his cases clearly demonstrated that a healthy spleen might rupture spontaneously. Spontaneous rupture of a diseased spleen is common. Alterations of the spleen that predispose to rupture occur especially in infectious or toxic conditions of the body with enlargement of the spleen and softening of the parenchyma referred to as acute splenitis or acute splenic tumor (2). This condition, coupled with the loss of protection suffered when the enlarged spleen extends below the costal cage, exposes the organ to minimal though potentially serious trauma. This trauma may be either external or internal. In a number of patients the rupture has appeared to be spontaneous.

Rupture of a healthy spleen occurs after severe direct or indirect trauma; doubts regarding the cause of the rupture should arise only in exceptional cases. Traumatic rupture of a diseased spleen, however, occurs only after minimal trauma. The exposed position of the enlarged friable spleen subjects it to the dangers of trauma incident to such stresses as sudden motion, coughing, sneezing, or defecation. The danger of external trauma is obvious.

Rupture, whether spontaneous or traumatic, occurs more readily in the presence of such anatomic changes as: (a) abnormal mobility of the spleen; (b) peri-splenic adhesions that fix the organ to adjacent structures; (c) extreme congestion; and (d) loosening or destruction of the parenchyma of the spleen as the result of systemic and local infections, circulatory disturbances, necroses, or tumors. Among the

infectious diseases, malaria is the chief cause of spontaneous rupture of the spleen. Leighton, in 1939, compiled 73 such cases from the literature (3). Rupture has not infrequently occurred in therapeutically induced malaria (4). Typhoid fever is the next most frequent cause of spontaneous rupture. It has also been reported in paratyphoid fever, relapsing fever, cholera, tuberculosis, syphilis, and in various types of septic or toxic conditions.

Circulatory disturbances, either general or local, may be major factors in the occurrence of rupture of the spleen in pregnancy, parturition, puerperium, hepatic cirrhosis or carcinosis, cancer of the pancreas, portal thrombosis, isolated thrombosis of the splenic vein, and infarct of the spleen. Several cases have been observed in the leukemias, hemophilia, and thrombopenia. Referring to the infrequency of splenic rupture, whether spontaneous or traumatic, Krumbhaar (5) reports only 3 such cases in a series of 10,000 autopsies. As to the incidence of rupture of the spleen in cases of relapsing fever, Beveridge (6) reports a series of 116 patients with a mortality of 7 percent; in none was rupture of the spleen noted.

#### CASE REPORT

A 33-year-old man, who had been on duty in Korea for 6 months, was admitted to the 382d Station Hospital on 26 December 1948, complaining of general malaise, anorexia, frontal headache, chills, and fever of 3 days' duration. He had remained on duty until the day prior to admission, when, because of these complaints and a dull aching pain in the right upper abdominal quadrant, he stayed in his quarters where a physician saw him and gave him mild anodynes and sedatives. On admission to the hospital he stated that his bowels had been somewhat looser than usual but normal in color. He had had no nausea or vomiting, but had noticed that in the preceding 24 hours his urine had been slightly darker than usual.

His temperature was 101.8° F.; pulse rate, 90; respirations, 22; and blood pressure, 115/75. He was slightly obese and did not appear to be in pain. There was no jaundice or cyanosis. The liver and spleen were not palpable. There was slight tenderness on deep palpation in the right upper abdominal quadrant. The physical examination was otherwise normal. A tentative diagnosis of the prodromal phase of infectious hepatitis was made.

The patient was put to bed and given intravenous fluids. By early evening he was feeling much better and eating a soft diet. Urinalysis revealed 2 plus albumin, a negative reaction for bile, and normal microscopic findings. At 2200 he complained of a pain in the left upper abdominal quadrant. He appeared apprehensive and his temperature was 98.1°; the skin was cold; the pulse was rapid and thready; and the blood pressure was 36/20. There was an ill-defined abdominal tenderness without spasm or rigidity. Intravenous d-glucose solution was given. At 0100, 27 December, he appeared to be in shock. His spleen was not palpable. At 0245 his blood pressure was 86/20 and he appeared to be recovering from shock. At that time the spleen was palpated 3 fingerbreadths below the left costal margin. It was soft and tender, and the patient complained of pain in the left upper abdominal quadrant accentuated by respiration. A friction rub was present. A diagnosis of splenic infarct with

possible rupture of the spleen was made. Three units of plasma were given with d-glucose in saline solution. At 6:45 his blood pressure was 105/70. At 6:50, the patient became suddenly dyspneic and again showed signs of severe shock. He was placed in an oxygen tent and given stimulants and analeptics. The pulse became imperceptible and the blood pressure fell rapidly. He died at 6:55. The spleen did not increase in size in the last 3 hours, but the abdomen felt doughy and seemed to increase in size. The clinical diagnosis was spontaneous rupture of the spleen with severe intraperitoneal hemorrhage, cause unknown.

*Pathologic findings*.—The abdomen was protuberant. The peritoneal cavity contained about 5000 cc. of recently clotted blood and thin bloody fluid; most of the clotted blood was in the left upper abdominal quadrant surrounding the spleen. The diaphragm was very high bilaterally. The spleen weighed 315 gm. and was large, soft, and pulpy. In the anterior midportion there was a ruptured area 3 to 6 cm. wide, which extended inferiorly to involve most of the pole. The cut section was blue-purple with indistinct and absent markings, and much soft semiliquid material. There was no evidence of perisplenic adhesions or any disease in the spleen. The coronary and systemic arteries showed minimal atherosclerosis. The lungs showed acute congestion. The liver was large and congested with a suggestion of minimal fatty change. The microscopic examination of the spleen and liver revealed numerous spirochetes identified as *Borrelia recurrentis*. The peripheral blood smear also showed many spirochetes.

Louse-borne relapsing fever is present among the natives in Korea.

#### REFERENCES

1. LUNDHILL, G.: Spontaneous rupture of spleen. *Acta chir. Scandinav.* 75: 547-550, 1934.
2. STRONG, W. L.: *Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases*. The Blakiston Co., Philadelphia, Pa., 1943.
3. DAHLE, M.: Rupture of normal spleen without known cause. *Acta chir. Scandinav.* 75: 519-523, 1934.
4. DE SARAM, G. S. W., and TOWNSEND, R. F.: Spontaneous rupture of spleen in malignant tertian malaria. *Lancet*, 1: 584-585, May 8, 1943.
5. KREMERHAAR, E. R., and STENGEL, A.: The spleen in the leukemias. *Arch. Path.* 34: 117-132, July 1942.
6. BEVERIN, L. C. E. G.: Louse-borne type of relapsing fever as prevalent in Anglo-Egyptian Sudan. *Med. J. Australia* 1: 110-112, Jan. 28, 1928.



# Psychiatry in General Practice<sup>1</sup>

JAMES L. MCCARTNEY, *Commander (MC) U. S. A. R.*

EVERY physician must consider the influence of emotional factors in the patient. More than any other, the general practitioner has considered the feelings and the personality of the sick, and his efforts along this line have been rewarded by the loyalty of his patients. So many physicians in the Army and Navy saw the successful integration of psychiatry with general medicine and surgery, that there has been an increasing desire to learn more about psychiatry and its contribution to medical practice. The average practitioner meets a psychosis only in the exceptional case, although about 1 in 15 of the general population is apt to develop a psychosis, and up to 80 percent of the patients seen in a general practice will complain of symptoms which might be diagnosed as psychoneurosis.

A psychoneurosis is essentially a subconscious attempt of the individual to adjust to his environment, while a psychosis is the failure to make that adjustment, and therefore a flight from reality.

In spite of enlightened medical teaching, there is still a general feeling among many physicians that all pathologic lesions are attributable to some physical cause—trauma, bacterial invasion, or deteriorative change. There is a preponderance of scientific evidence which proves that not only can physiologic function be altered, but actual lesions of tissue can be brought about by psychically produced impulses. But to cause anatomic damage these impulses must be intense and long-sustained.

Situations in the environment are observed by the sense organs and are transformed into nerve impulses. Visual impulses are conducted by the optic nerve to a way-station in the lateral geniculate body, then to the visual centers in the occipital lobe, and then conducted to association centers in the frontal lobe. Similarly, the auditory impressions travel by way of the cochlear nerve, pass a way-station in the medial geniculate body to reach the auditory centers in the temporal lobe then they are conducted to the association centers in the frontal lobe. These, combined with other sensations such as taste, smell, and touch, allow the individual to get an impression of his environment.

<sup>1</sup> Presented before the Nassau County Medical Society.

As the individual interprets these sensations, various emotional states are produced. If the dominant state is fear, anger, or resentment, reaction mechanisms may be set in motion, which in the primitive state may have been advantageous for the survival of the individual. But in modern life, the manifestations of these emotions may be unacceptable and so are suppressed, and inner tension is likely to develop. This tension cannot long be continued without release, and the release may take the form of neurotic symptoms.

As medical students we studied frogs in order to learn something about physiological processes, but we can learn something more from those frogs. A frog can do very well minus a cerebrum. Confine a decerebrated frog and a normal frog under a glass jar and let flies into the jar. The frog that lacks a cerebrum will catch many more flies than his normal companion. In fact he will catch all the flies, and the other frog none. The cortex of the normal frog evidently makes him subject to inhibitions and fears. He devotes his time and attention to the problem of getting out of the glass jar. The decerebrated frog does not recognize the existence of such an intellectual or philosophical problem. He takes things as they are and is quite content to live a life on a lower plane. Hence he devotes himself unreservedly to catching flies. The brainless frog grows healthy, while the intellectual frog fears, speculates, philosophizes, and starves himself to death. If he were a human, he would develop a neurosis, or an exophthalmic goiter, or else become insane.

Pavlov's (1) work with dogs, demonstrated that if the same stimulus was repeated a sufficient number of times under certain environmental conditions, conditioned reflexes were developed, and the dog was unable to discriminate between changing environment or stimulation. In other words, the dog failed in his adaptation and this failure to interpret the stimuli correctly resulted in distressing emotional uncertainty, confusion, fear, and frustration, i. e., a neurosis.

Modern psychiatry is based on the fundamental contributions of three men. The physiologist, Cannon, who was one of the first to study the physiological manifestations and ramifications of the emotions. He clearly showed how the glands of internal secretion were tied up with our feelings. Pavlov, as stated before, conducted ingenious research on the nervous system integrations involved in the process of learning, habit formation, and conditioning. Freud traced the origin of many emotional illnesses to childhood and infantile experiences, and investigated the complex conditions that influence the individual in his family life. Although these three physicians enunciated the fundamentals of psychosomatic interpretation, numerous other psychologists and physicians have made many additional contributions.

Of 1,000 patients studied at the Lahey Clinic, 406 were found to have nervous problems of clinical importance (2). In 272 patients, the complaints were purely neuropsychiatric; and in 134 a combination of physical and significant neuropsychiatric disorders were found. In this latter group, 39 had independent and unrelated physical and nervous problems; in 73 the physical disorder was aggravated or provoked by a primary nervous state, and in 22 the nervous state was considered to be secondary to the physical disorder.

Yet, on the other hand, to try and single out certain diseases as psychosomatic is futile, as every disease is essentially psychosomatic, because both psychological and somatic factors have a part in its cause and influence its course. Thus, even though a disease may appear to be restricted to a physical disorder, such as tuberculosis, appendicitis, or myocarditis, even these illnesses might be considered to have a mental component. The degree of mental and nervous reaction will depend on the basic personality of the patient as well as other factors, including the seriousness of the illness, the degree of suffering, uncertainty regarding the outcome, interference with work and other plans, and financial loss.

Further analysis showed that of the 406 neuropsychiatric patients there were 3 cases of psychosis and 7 borderline cases, including 5 cases of mental depression. In 75 patients a clear-cut diagnosis of psychoneurosis was made. Of the remaining 321 patients, neither the diagnosis of psychosis nor of psychoneurosis was made.

The diagnosis of a nervous condition should not depend merely on exclusion of organic disease; in fact, 1 in 7 of the above patients had both physical and nervous disorders of importance. Recognition must depend on observation of the characteristic manifestations of the nervous disorder itself. Some of the complaints are pathognomonic, such as globus hystericus and sighing respiration with difficulty in getting a satisfying breath. Signs of nervous tension may be bitten finger nails, flushing of the face, and variable tachycardia. The fatigue resulting from nervous tension has special characteristics. These include variability unrelated to physical activity: it is usually worse in the morning, decreasing after activity. Some patients complain of worries, low spirits, inability to enjoy work and social relationships, difficulty in making decisions, and disturbing mental conflicts. In many patients a background of constitutional inadequacy, and a family history of "nervous breakdown" can be found. The onset of complaints is usually vague, and frequently dates back to childhood.

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COVER PHOTOGRAPH

—U. S. Army Photograph

*C-54's preparing to fly patients from the  
Philippines to the United States*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

MEMO: Personnel of the Medical Services, The United States  
Armed Forces

Since the Office of Medical Services is relatively new in the organic structure of the Department of Defense, I should like to feel that all the members of our family in the military medical services have a clear picture of the purposes of this office and the principles on which it operates.

The Secretary of Defense has charged the Director of Medical Services with - among other things - the establishment of medical policies and program, and general direction of administration in the medical services of the armed forces through the Heads of the Departments thereof. In any properly-functioning organization, there is no such thing as isolated policy-making. The pulsations of daily operations must reach into the levels where policies are considered and make themselves felt. Policy cannot be inspired without some ideas. At the same time, an action program is meaningless without policy - and a policy can be framed only on the basis of inspiring ideals.

Eventually and inevitably, the policies of the medical services are generated by the staffs who actually provide professional care to the men and women in uniform. The vigor and vision with which all of us seek constant improvement will not only reflect our day-to-day proficiency but also will ultimately spell out the policies which guide the whole program in the Department of Defense.

*Richard L. Meiling*

Richard L. Meiling, M. D.  
Director of Medical Services

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## Streptomycin in Pulmonary Tuberculosis

### Treatment of Recent Posthemoptoic Spreads

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**D**URING our studies of the effect of streptomycin upon various types of pulmonary lesions, seven patients were selected for treatment because of recent posthemoptoic spreads. Each of the seven, by chance, was given a different amount of streptomycin. Each, as a consequence of hemoptysis, showed evidence of progressive tuberculosis. Prior to treatment, their clinical condition was critical, or nearly so, and the prognosis extremely poor. As a result of streptomycin therapy four patients showed dramatic improvement, one moderate improvement, and two were complete failures.

Hemoptysis is commonly followed by a bronchogenic dissemination of blood containing tubercle bacilli into a new portion of lung, resulting in a local pneumonitis which is made up of two components; a hemoptoic component due to the blood per se, and an exudative tuberculous component. A high fever and evidence of acute toxicity occurring within a day or so of the hemoptysis is indicative of the hemoptoic component; this may largely resolve within a comparatively short

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time. A persistence or steady increase in the new area of infiltration after the acute episode has subsided indicates a persistence or progression of the tuberculous seeding. This may be indicated clinically by fever and continued weight loss. Although the bleeding had stopped in each of our seven patients they showed evidence of progression of the post-hemoptotic lesion.

### CASE REPORTS

*Case 1*—A 49-year-old Filipino man was admitted on 10 July 1946 with an old fibrocaseous lesion in the right upper lobe. A right pneumothorax was induced but proved ineffective. During December 1946 the reexpanding pneumothorax was complicated by a tuberculous empyema followed by a bronchogenic spread to the left midlung. The empyema subsided but the bronchogenic spread slowly progressed. On 2 May 1947 there was a moderate hemoptysis and fever, which soon reached 103° F. A chest roentgenogram revealed a posthemoptotic spread to the left base. He received 30,000 units of penicillin every 3 hours from 8 May to 17 May, during which time the acute symptoms subsided. In spite of this, the dyspnea progressed, he lost weight rapidly, and his condition became critical. Serial chest roentgenograms showed increase in the extent of the post-hemoptotic spread. On 20 May 1947, 18 days after the hemoptysis, streptomycin therapy was begun (fig 1). He received a total of 2 gm daily in 5 intramuscular injections. This was continued for 120 days, ending 24 September 1947. The course was marked by only fair symptomatic improvement because of severe symptoms of vestibular nerve damage; these symptoms persisted for some time after streptomycin had been discontinued. There was apparent complete loss of the vestibular nerve function after the fifty-seventh day of therapy. The sputum remained positive during the period of treatment. The tubercle bacilli continued sensitive to streptomycin until some time after the fifty-sixth day of treatment, and were highly resistant shortly before treatment was terminated. There was distinct resolution of the posthemoptotic spread in the left lung as well as of the preexisting bronchogenic spread (fig 2).



Figure 1—Case 1. 20 May 1947. The posthemoptotic spread occupies the lower portion of the left lung.



Figure 2—Case 1. 25 September 1947. After 120 days of streptomycin (2 gm. daily) the spread shows distinct resolution.

This patient has been observed for 26 months during which time the improvement has been gratifying. The last positive sputum was on 15 October 1947, since then repeated monthly sputum and gastric cultures have been negative. The remaining infiltration in the left base continued to resolve and the left lung has been clear since January 1948. The patient compensated earlier for the loss of vestibular function and is slowly regaining the response to caloric stimulation. He is ready for discharge.



Figure 3.—Case 2. 19 August 1947.  
*The posthemoptoic spread occupies the lower two-thirds of left lung and right midlung.*

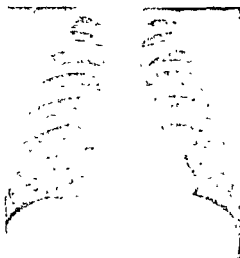


Figure 4.—Case 2. 30 December 1947.  
*After 120 days of streptomycin (1 gm. daily), the spread has completely cleared.*

*Case 2.*—An 18-year-old white man was admitted on 12 June 1947 because of sudden hemoptysis. The next day his temperature was 103.5° F. and he had chills and sweats. A chest roentgenogram on 14 June showed a soft lesion with a small cavity in the left second anterior interspace, scattered exudative infiltration of posthemoptoic origin throughout all the left lung, and extensive bronchogenic spread to the right midlung. He continued to hemorrhage intermittently until 28 June. He received penicillin from 14 June to 3 July during which time the acute symptoms subsided. After this he continued to have a low-grade fever and by 24 July he had lost 24 pounds. On 31 July, crushing of the left phrenic nerve was done. Serial chest roentgenograms then showed progression of the bilateral posthemoptoic infiltration.

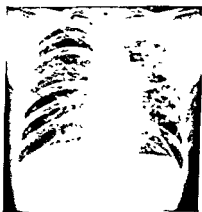
On 3 September 1947, 2½ months after the onset of the hemoptysis, streptomycin therapy was begun (fig. 3). He received 1 gm. streptomycin daily, in 2 divided doses 12 hours apart for 120 days, ending 1 January 1948. By the end of this period there was symptomatic improvement, a weight gain of 20 pounds, complete resolution of the extensive posthemoptoic spread, and closure of the cavity. The only remaining roentgenographic finding was a residual fibrotic lesion in the left second anterior interspace (fig. 4). The only manifestation of drug toxicity was a temporary decrease in the caloric response. The sputum and gastric cultures were converted early during the period of treatment, and the only subsequent positive finding was a single gastric culture obtained 1 month after therapy was discontinued. The tubercle bacilli were still sensitive to streptomycin. The patient continued to improve. He was finally transferred to a Veterans' Administration hospital 27 February 1948.

**Case 3**—A 42-year-old Filipino man was admitted 4 October 1946. A chest roentzenogram showed a dense shadow in the left midlung suggestive of local atelectasis. A 2-cm. cavity was present in this lesion. Bronchoscopic examination showed extensive ulceration and almost complete stenosis of the visible portion of the left main bronchus. He received 2 gm. streptomycin daily for 120 days from 11 June to 2 October 1947, with complete clearing of the endobronchial lesion, evidence of considerable roentzenographic improvement but with indifferent symptomatic response. High bacterial resistance as well as complete loss of vestibular function was present before the end of therapy.

On 6 December 1947, 2 months later, there was frank hemoptysis followed by an acute febrile course. A chest roentzenogram on 11 December (fig. 5) revealed a massive bilateral hemoptotic spread; by this time the patient was critically ill. On 13 December, 1 week after the initial hemoptysis, streptomycin retreatment was begun. He received 1 gm. daily in 2 divided injections, 12 hours apart. There was no symptomatic response. The patient's downhill course continued. There was first some clearing of the recent spread, due perhaps to resolution of aspirated blood followed by progression of the tuberculous component. Streptomycin was discontinued 3 February 1948 after 53 days of ineffective treatment (fig. 6). The patient died 1 March 1948.



**Figure 5**—Case 3 11 December 1947. An extensive posthemoptotic spread is present in both upper lobes. High bacterial resistance.



**Figure 6**—Case 3 3 February 1948. After 53 days of retreatment (1 gm. daily), there was persistence and increase of the tuberculous component.

This case demonstrates the apparent futility of streptomycin in the presence of high bacterial resistance.

**Case 4**—A 37-year-old Filipino man was admitted to the sick list aboard ship on 26 September 1946, because a routine chest roentzenogram revealed a fibrocavitary lesion containing a small cavity in the right upper lobe. Right pneumothorax having failed, crushing of the right phrenic nerve was done and pneumoperitoneum was induced on 27 November 1946. He was apparently doing well until 1 October 1947 when hemoptysis followed by fever and an extensive posthemoptotic spread to the right base and to all of the left lung occurred. He did not become acutely ill at the time, but there was progressive dyspnea. By



Figure 7.—Case 4. 5 December 1947. The posthemoptoic spread is in the right base and throughout the left lung.



Figure 8.—Case 4. 1 April 1948. After 120 days of streptomycin (one-half gm. daily), the spread has almost completely cleared.

5 December 1947, 2 months after the initial hemoptysis, when streptomycin therapy was begun, he was critically ill. Serial chest roentgenograms showed an increase in the bilateral posthemoptoic infiltration (fig. 7). He received the daily dose of one-half gm. streptomycin given in single injections for 120 days, ending 3 April 1948. By the end of the 120-day period he no longer appeared ill, and had regained his normal weight. There were no symptoms of drug toxicity. The post-hemoptoic spread had almost entirely cleared (fig. 8). Although the sputum remained intermittently positive, bacterial resistance to streptomycin did not develop.

He has been observed for 20 months, during which time a 3-stage right thoracoplasty has been done. There has been no relapse. Sputum and gastric cultures have been negative for the past 6 months.

**Case 5**—A 34-year-old white man was admitted on 14 July 1947, with exudative infiltration and early cavitation in the right first and second anterior interspaces. There was also a minimal bronchogenic spread to the left midlung. Right pneumothorax was ineffective, so this procedure was abandoned in favor of pneumoperitoneum which was induced 5 April 1948. Meanwhile the bronchogenic spread in the left midlung was increasing in extent. Hemoptysis occurred 23 April 1948, followed in 2 days by high fever. By 29 April a posthemoptoic spread was evident in the left lower lobe. Penicillin was administered from 4 May to 11 May during which time the acute symptoms subsided. In spite of this the general condition of the patient grew steadily worse. Serial chest roentgenograms showed progression of the new spread. On 25 May 1948, 1 month after the initial hemoptysis, streptomycin therapy was begun (fig. 9). He received 1 gm. daily in single injections for 42 days, ending 5 July 1948. By the end of this 42-day period the clinical and roentgenographic improvement was no more than fair. There were no symptoms of drug toxicity. The sputum remained positive for tubercle bacilli and these continued to be sensitive to streptomycin. After this the improvement continued until by the one hundred and twentieth day after streptomycin was begun the posthemoptoic spread had entirely cleared, and in addition there was evidence of resolution of the previously

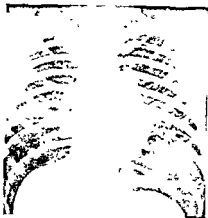


Figure 9—Case 5 25 May 1948 The posthemoptitic spread is in the left lower lobe

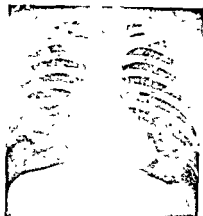


Figure 10—Case 5 21 September 1948 After 120 days (1 gm streptomycin daily for the first 42 days), there is clearing of the spread

progressive infiltration in the left midlung (fig 10). In fact, this patient did as well as those given streptomycin for the entire 120 days.

He has been observed for 14 months, during which time the sputum and gastric cultures have been negative.

**Case 6**—A 57-year old white man was admitted 25 April 1948, complaining of progressive fatigue, weight loss, and shortness of breath during the past year. The chest roentgenogram showed fibrocaceous infiltration with cavitation in both upper lobes. The hospital course was not unusual until 13 May when hemoptysis, with repeated hemoptitic episodes during the next few days, occurred. On



Figure 11—Case 6. 1 June 1948 A posthemoptitic spread occupies the left midlung and right base



Figure 12—Case 6 28 September 1948 After 120 days (one-half gm. streptomycin daily for the first 42 days), there is moderate clearing of the spread

20 May, his temperature was 101.8° F., and following this the fever continued and the patient rapidly lost weight and strength. Serial chest roentgenograms revealed a posthemoptoic spread to the right base and left midlung. On 1 June, 12 days after the onset of the acute course, streptomycin was administered (fig 11). He received one-half gm. daily in single injections for 42 days, ending 12 July. By the end of the 42-day period there was considerable symptomatic improvement together with moderate resolution of the bilateral posthemoptoic spread. The sputum remained positive and the tubercle bacilli continued to show sensitivity to streptomycin. Following the forty-second day there was further resolution of the residual spread but by 120 days after streptomycin was first begun, cavitation was evident in the left midlung lesion (fig 12).

Considering it quite possible that this patient had received insufficient streptomycin, a second 42-day course was given beginning 21 September 1948, using the same dose of one-half gm. but with no further improvement. Again bacterial resistance did not develop. The patient has been observed for 13 months and still shows no improvement.

#### DISCUSSION

In comparing the symptomatic response under the various dosages employed, most noteworthy was the very slow improvement in the patient who received the daily dose of 2 gm. of streptomycin; this was undoubtedly due to toxicity of the drug. The 2-gm. dose is more toxic to some patients than to others. The symptoms of vestibular nerve disturbance may be particularly troublesome; interfering with appetite, weight gain, and general physical rehabilitation. The one-half gm. daily dose was hardly toxic, while the 1-gm. dose was only slightly more so.

With respect to the roentgenographic improvement seen in those patients which responded to streptomycin, it was evident that all the regimens were equally effective, with exception of the case treated with one-half gm. streptomycin daily for 42 days. Although the improvement in this instance was moderate during the 42-day period, and there was some further improvement subsequently, the final result was not satisfactory. However, many patients fail to respond to much larger doses, and we cannot conclude from experience with a single case that the one-half gm. dose of streptomycin given for 42 days would be generally inadequate. It was interesting to note, and this is supported by observations on a much larger number of patients treated for exudative lesions at this hospital, that the frequency of streptomycin administration, whether five times daily, twice daily, or once daily, had no apparent effect on the results.

Generally with *Mycobacterium tuberculosis* not previously exposed to streptomycin, growth will be inhibited by a very low concentration of the drug; usually one microgram or less of streptomycin per milliliter of media. There is growing evidence that we may be dealing with a mixed flora in which organisms sensitive to streptomycin so greatly outnumber those that are resistant that it is quite difficult

to detect the resistant strains unless special methods are employed. After sufficient contact with streptomycin the sensitive bacteria may be inhibited, permitting the resistant strains to flourish until a predominantly resistant population is present in the sputum. Whatever the process underlying production of resistance, once present this resistance is apparently permanent. That resistance is of extreme importance is emphasized by the therapeutic failure of streptomycin in the case described in this report.

Another confusing factor in the problem of resistance is that all patients do not develop resistance at the same rate. Wide variation exists in this, some becoming highly resistant during the first 30 days of treatment, others remaining sensitive during an entire 120-day period. The Streptomycin Committee of the Veterans' Administration has recently reviewed the results obtained in the treatment of a large number of patients with streptomycin on the various doses for 120 day periods. Approximately 70 percent of these patients were streptomycin-resistant by the end of 120 days, whether the daily dose was 2, 1, or  $\frac{1}{2}$  gm. Cases 2 and 4, still sensitive after 120 days of treatment, fortunately fall within the 30 percent that do not become resistant. A relatively small percent of the patients treated became resistant during the first 42 days of the 120-day period. It therefore appeared advantageous and therapeutically sound to treat patients for a shorter time and still obtain satisfactory results. Until further data are available, we therefore recommend 1 gm. of streptomycin for 42 days in the treatment of selected cases of recent posthemoptotic spreads.

As demonstrated, dramatic results may be obtained but this emphatically does not mean that all such cases should receive streptomycin. It is common knowledge that a considerable number of posthemoptotic spreads resolve spontaneously on bed rest alone. In our experience, penicillin, administered from 7 to 10 days, may appreciably shorten the initial acute febrile episode so often associated with fresh posthemoptotic lesions, by controlling the hemoptotic component of the lesion. If the infiltration then shows further evidence of resolution, and is not too extensive, streptomycin might not be indicated. However, progression may take place, with or without penicillin, or the new lesion, extensive in nature, may remain stationary. The decision then, as to whether streptomycin should be given, will depend upon circumstances of the individual case. If the drug is to be used, treatment should not be deferred too long, since the more recent the tuberculous exudative component, the more effective streptomycin will be. The course of the disease can generally be determined within 2 months of the acute hemoptotic spreads. In the so-called "panic" case, with massive posthemoptotic spread and

fulminating illness where time is a vital factor, streptomycin given promptly, possibly combined with penicillin for the first 2 weeks, may constitute the major factor in the patient's ultimate recovery, provided that bacterial resistance is not present initially.

### CONCLUSIONS

1. Streptomycin is an effective agent in treating the tuberculous component of recent posthemoptoeic spreads, provided the tubercle bacilli are sensitive.

2. The two-gm. daily dose is too toxic and has no advantage over one-gm. or one-half-gm. daily dose.

3. Streptomycin may be administered in a single daily intramuscular injection without loss of therapeutic efficacy.

4. The 120-day regimen is apparently too long a period of treatment. Evidence to indicate that 42 days may be sufficient is presented.

5. The 42-day period of treatment, with daily dose of 1 gm in a single injection is suggested, as bacterial resistance generally does not develop during this period. In case of relapse, retreatment is more likely to be effective.





# "Painful Feet" in American Prisoners of War

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A LARGE number of Americans who were prisoners of war in the Philippines suffered from a bizarre disease in which the principal symptom was "pain in the feet." The disease was undoubtedly due to dietary deficiencies but differed from classical beriberi

## HISTORY

Several authors quoted by Labernadie (1) described similar syndromes; one occurred among soldiers on a deficient diet while on campaigns in Europe during the latter part of the eighteenth and early part of the nineteenth centuries. A pseudo-epidemic occurred in 1854 among troops in Crimea; a second occurred during famines following wars; and a third, under the name *actodynia* raged through an old people's asylum and among the population around Paris. In Indochina the expression "burning of the feet" has become current in the medical vocabulary and one finds reference to it frequently in the Annual Health Service Reports of Pondichéry; officers who had been in charge of the prisons in 1818 had often observed these cases of burning feet and believed the cause to be the dietary regime. Labernadie described one of his own cases who had almost identical symptoms and signs as those which occurred in American war prisoners; the patient had a positive blood Wassermann test and because anti-syphilitic treatment resulted in a favorable response he concluded that the burning of the feet was syphilitic in origin.

A Japanese physician reported to the author that Nipponese troops around Hong Kong had had similar symptoms which the Japanese physicians thought to be caused by cold weather. This same physician had examined the literature in the Bureau of Science in Manila and found three articles describing a similar syndrome occurring in Malaya, British Somaliland, and British Guiana. In one of

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these locations the painful burning feet were noted to occur in female Chinese laborers but not in male Chinese laborers. It was observed that the women washed their rice prior to cooking and threw away the washings, but the men cooked their rice unwashed. It was concluded from this that there was a vitamin B deficiency in the rice eaten by the women. However, the disease was not believed to be classical beriberi.

A painful feet syndrome, apparently identical with that being described, occurred in other allied prisoners of World War II in the Far East (2) (3) (5). Burgess (4) described neuritis and edema among British prisoners in Singapore but did not give a detailed clinical picture of the condition.

### INCIDENCE

The present discussion is based upon observations made of the disease when it first appeared at Cabanatuan prison camp on Luzon, in September 1942, 10 months after the beginning of the war and 6 months after the beginning of imprisonment. Four months following the appearance of the syndrome, and at the time of its greatest incidence, of 2,600 patients admitted to the hospital for all causes 75 percent complained of painful feet. The incidence among the remainder of the camp population was also high, although no accurate data are available. Medical officers reported a large number of cases in other prison camps in the Philippines.

### NUTRITIONAL BACKGROUND

The following description of the dietary situation is the basis for assuming that the primary etiologic factor in this disease was dietary deficiency.

Prior to their arrival at Cabanatuan prison camp on 1 June 1942, American prisoners had already experienced starvation and often illness for 1 or 2 months, depending on whether they were captured on Bataan or Corregidor. Also, during the defense of these areas most troops were placed on one-third field rations, which consisted principally of polished rice, and at times small amounts of canned meat, fish, or fresh carabao meat. Many persons, especially in the forward areas, had received even less food and before the capitulation of Bataan on 9 April 1942, a few cases of nutritional edema had been seen. On arrival at Cabanatuan early in June 1942 a number of the prisoners had nutritional edema.

From 1 June 1942 to November 1942, the diet given the prisoners contained only 800 to 1,000 calories per man per day, and consisted almost entirely of polished rice and a green leafy swamp weed, kangkong. A few gourds and native squash had been issued before kangkong was made available. At times, yellow or white corn was

added to the diet in lieu of kangkong. The prisoners received no meat. The condition of painful feet first appeared during this period. The few individuals who had money during these first several months were able to buy extra food in the commissary, such as canned meat and fish, peanuts, beans, bananas, oranges, limes, sugar, and coconuts. Very few had money after a month or two and the remainder had to depend entirely on the Japanese-issue diet. It is interesting to note that more than one-third of all money spent by prisoners during this desperate period of starvation was used to buy tobacco.

Beginning in December 1942, and for approximately the next year, the diet furnished by the Japanese was supplemented by Red Cross food supplies<sup>1</sup> and food purchased in the commissary. This diet contained 2,000 to 3,000 calories per day, largely in the form of carbohydrate foods such as polished rice, camotes, casaba, gabi, or corn. During this period approximately 50 gm. of carabao meat were issued daily per man by the Japanese, and additional carabao meat was purchased through the commissary from welfare and private funds. There was a scarcity of fat in the diet. The Japanese maintained that they were issuing 20 gm. of lard substitute or coconut oil per man per day, but in general, this figure exceeded the amount actually received.

It was difficult to determine the vitamin content of the diet. The polished rice was dirty and contained so many bugs, rocks, and worms that repeated washings were required. There is a possibility that a large part of any B<sub>1</sub> remaining in the aleurone layer of the kernels after milling, was thrown away with the washings. The green vegetables in the form of squash, okra, eggplant, tilinum, camote tops, and radish tops contained some B<sub>1</sub>, but they were boiled for a considerable time, thus destroying much of the thiamine, even though it is known to be quite heat resistant. In addition, a number of persons insisted on discarding the water in which the vegetables were cooked. The nicotinic acid content of the diet was almost negligible except for those who could afford to buy supplementary foods, such as peanuts. Vitamin C was received in adequate quantities in the form of limes, tomatoes, oranges, and pomelos. However, a few cases of clinical scurvy did occur. A few eggs purchased from the welfare fund for the needy, carotenes in the yellow corn, and green leaves of kangkong, tilinum, camote tops, and radish tops were the only known sources of vitamin A in the diet. Beginning in November 1942 about two carabao livers per day were available for the sick. After several months of imprisonment, a limited amount of cod liver oil was available for treatment of cases with signs of vitamin A deficiency. However, in September 1942 when cases of xerophthalmia suddenly oc-

<sup>1</sup> Each man received 2½ 11 pound boxes of canned food and in addition there was considerable bulk food issued through the general mess from the Red Cross shipment.

curred in large number, the supply of cod liver oil was so meager that only enough could be spared to instill a few drops into the conjunctival sacs of patients with corneal involvement.

The diet again became poor in December 1943, but fortunately another shipment of Red Cross foods and medicine arrived. Each man received  $4\frac{1}{8}$  11-pound boxes of food from this shipment. It appeared as if the Japanese deliberately cut the issued rations when it became known that American Red Cross food was on its way to the camp. The Red Cross food lasted 3 or 4 months, after which time the prisoners had to depend almost entirely on the Japanese-issue diet, which at this time approached in quality and quantity the diet received during the first 6 months of imprisonment.

The deficiencies in the diet were aggravated by other conditions prevalent in the camp. Because of dysentery or diarrhea, many patients derived very little benefit from their already skimpy diets, and in addition, those with untreated active malaria, suffered from a loss of appetite. Another factor which may have led to the loss of water-soluble vitamins was the unexplained diuresis, especially nocturnal, which was experienced by almost everyone.

### PATHOLOGY

Unfortunately, the Japanese would not permit autopsies to be performed on Americans who died in the prison camp until February 1943. At this time the death rate was only three or four per month, and only one man with a history of painful feet was known to have died after this date. His painful feet had occurred several months previously and were clinically cured at the time of his death. At autopsy nothing suggestive of vitamin deficiency was visible grossly. There was no enlargement of the heart and no excess fluid in serous cavities.

### SYMPTOMS AND SIGNS

In general, the disease followed a more or less characteristic pattern. Usually the first symptom was a slight aching in the balls of the feet, unaffected by walking or movement of the joints of the feet. However, fear that motion would increase the discomfort led to a tendency to favor the feet in walking. For example, in walking down stairs, the patients would side-step down and often steady themselves by placing a hand on the edge of the doorway rather than descending a step at a time. The pain which has a prominent burning component, gradually increased in severity, and was described as a constant burning ache across the balls of the feet, being more severe in the region of the metatar-phalangeal joint of the big toe. The pain was continuous and definitely interfered with sleep. The discomfort was

described as deep, seemingly in the bones, and definitely not in the skin. Many patients would walk around most of the night feeling that it was useless to attempt to sleep. Others complained that the pain was so severe that they feared they would become insane. Still others evidenced emotional instability manifested by crying spells. Words hardly suffice to describe the agony experienced by men afflicted by this syndrome. When reclining they struck a characteristic pose lying on their backs, their feet in the air with the thighs and knees flexed. A characteristic gait was developed in which the knees were lifted somewhat higher than usual and the legs were lifted but not extended in stepping, so that the legs were practically perpendicular to the ground. By this means the feet always struck the ground flat, resulting in a springless gait and shifting of the body laterally to the side of the foot striking the ground to lessen the impact. As motion of the foot joints did not increase the pain, no reason could be ascribed for this gait. Occasionally in very severe cases similar pain involved the hands.

Shortly after the onset of the burning, aching pains in the balls of the feet, a second type of pain occurred, characterized by sharp excruciating shooting pains arising in the vicinity of the metatarsophalangeal joints, especially the first and second. At times in very severe cases, these pains also radiated up the legs. If the hands were involved, the pains sometimes radiated up the arms. These pains were of short duration, lasting only a few seconds, but making their appearance at any time of the day or night. They were described to be very much like severe electrical shocks and often of such severity as to cause the afflicted to jump and cry out.

Hyperesthesia of the skin of the feet was always present in varying degrees, being most severe on the dorsal surfaces of the toes, and also involving the soles of the feet in severe cases. Hypersensitivity was so intense in most cases that it made the weight of bed clothes unbearable. Scratching or touching the toes or soles of the feet would cause many patients to jump and scream violently. It was cruel to perform a Babinski test in these cases. Persons complaining of hyperesthesia of the skin of the soles of the feet developed a different mode of navigation. In order to reduce the contact area of the extremely hypersensitive plantar surfaces, these wretched patients hobbled around only when absolutely necessary and then on the external margins of the feet.

Peculiar dull red mottling of the skin of the feet, especially in the distal portions, was noted in almost all cases. This mottling was blanched by digital pressure and was accompanied by a superficial desquamation of the epithelium. Some noted hyperhidrosis of the feet. In some patients edema of the feet and legs was present, with no apparent relationship between edema and the development of the

painful feet syndrome. Many patients in the camp who developed edema did not become afflicted with painful feet and vice versa. In June, July, and August of 1942, the edema was very frequent and severe, whereas the painful feet first appeared the following September. The edema might possibly be explained as resulting from a deficiency of protein in the diet. However, Keys (7) has warned against such a simple explanation of famine edema and has described its occurrence in starvation with normal plasma protein levels. (Unfortunately, we had no laboratory facilities to perform blood chemistry determinations.) Absence of other signs of heart failure made the possibility of cardiac edema unlikely. As a rule, patients with extensive dependent edema were not bedfast, and experienced no difficulty in getting around except for the unwieldiness of their legs caused by the increased weight. The edema of the feet often stretched the dorsal skin to the breaking point, resulting in large weeping ulcerations. It was not unusual for patients, with or without painful feet, but with considerable edema, to spontaneously have extreme diuresis and lose all their edema in a day or two. Shortly thereafter they would complain of the appearance of the pains of the feet. On the other hand, some patients with painful feet without edema would subsequently have edema, at which time the pain would cease or become less severe, only to reappear when the edema was reduced.

Cardiac and respiratory symptoms were rare, but a few persons complained of precordial pain and tachycardia. Others said they felt their hearts were turning over. Examination of these persons showed a tachycardia of 120 to 150 per minute with numerous extrasystoles. There were no electrocardiographic or roentgenographic machines available. During the period that the condition of painful feet was prevalent a few sudden deaths occurred in young adults for which there was no obvious cause. Some of these may have been the result of cardiac involvement.

It is interesting that motor weakness or paralysis rarely occurred and then in only very severe and long-standing cases. Muscle atrophy did not occur except as a part of the general tissue loss from starvation. Muscular contractures did not develop in any of the cases, as was to be expected, because of the rarity of muscle paresis or paralysis. A few persons did develop footdrop, but it was impossible to determine whether this resulted from a dietary deficiency or was the result of a diphtheria epidemic which occurred in late 1942. (Before the fall of Bataan, three cases of peroneal nerve palsy with footdrop were seen, but they were not believed to have any relation to the condition being described because they came on so much earlier and were unaccompanied by sensory disturbances.) Two patients showed paralysis of leg muscles, but both had diphtheria in July or August 1942 prior to

described as deep, seemingly in the bones, and definitely not in the skin. Many patients would walk around most of the night feeling that it was useless to attempt to sleep. Others complained that the pain was so severe that they feared they would become insane. Still others evidenced emotional instability manifested by crying spells. Words hardly suffice to describe the agony experienced by men afflicted by this syndrome. When reclining they struck a characteristic pose lying on their backs, their feet in the air with the thighs and knees flexed. A characteristic gait was developed in which the knees were lifted somewhat higher than usual and the legs were lifted but not extended in stepping, so that the legs were practically perpendicular to the ground. By this means the feet always struck the ground flat, resulting in a springless gait and shifting of the body laterally to the side of the foot striking the ground to lessen the impact. As motion of the foot joints did not increase the pain, no reason could be ascribed for this gait. Occasionally in very severe cases similar pain involved the hands.

Shortly after the onset of the burning, aching pains in the balls of the feet, a second type of pain occurred, characterized by sharp excruciating shooting pains arising in the vicinity of the metatarsophalangeal joints, especially the first and second. At times in very severe cases, these pains also radiated up the legs. If the hands were involved, the pains sometimes radiated up the arms. These pains were of short duration, lasting only a few seconds, but making their appearance at any time of the day or night. They were described to be very much like severe electrical shocks and often of such severity as to cause the afflicted to jump and cry out.

Hyperesthesia of the skin of the feet was always present in varying degrees, being most severe on the dorsal surfaces of the toes, and also involving the soles of the feet in severe cases. Hypersensitivity was so intense in most cases that it made the weight of bed clothes unbearable. Scratching or touching the toes or soles of the feet would cause many patients to jump and scream violently. It was cruel to perform a Babinski test in these cases. Persons complaining of hyperesthesia of the skin of the soles of the feet developed a different mode of navigation. In order to reduce the contact area of the extremely hypersensitive plantar surfaces, these wretched patients hobbled around only when absolutely necessary and then on the external margins of the feet.

Peculiar dull red mottling of the skin of the feet, especially in the distal portions, was noted in almost all cases. This mottling was blanched by digital pressure and was accompanied by a superficial desquamation of the epithelium. Some noted hyperhidrosis of the feet. In some patients edema of the feet and legs was present, with no apparent relationship between edema and the development of the

painful feet syndrome. Many patients in the camp who developed edema did not become afflicted with painful feet and vice versa. In June, July, and August of 1942, the edema was very frequent and severe, whereas the painful feet first appeared the following September. The edema might possibly be explained as resulting from a deficiency of protein in the diet. However, Keys (7) has warned against such a simple explanation of famine edema and has described its occurrence in starvation with normal plasma protein levels. (Unfortunately, we had no laboratory facilities to perform blood chemistry determinations.) Absence of other signs of heart failure made the possibility of cardiac edema unlikely. As a rule, patients with extensive dependent edema were not bedfast, and experienced no difficulty in getting around except for the unwieldiness of their legs caused by the increased weight. The edema of the feet often stretched the dorsal skin to the breaking point, resulting in large weeping ulcerations. It was not unusual for patients, with or without painful feet, but with considerable edema, to spontaneously have extreme diuresis and lose all their edema in a day or two. Shortly thereafter they would complain of the appearance of the pains of the feet. On the other hand, some patients with painful feet without edema would subsequently have edema, at which time the pain would cease or become less severe, only to reappear when the edema was reduced.

Cardiac and respiratory symptoms were rare, but a few persons complained of precordial pain and tachycardia. Others said they felt their hearts were turning over. Examination of these persons showed a tachycardia of 120 to 150 per minute with numerous extrasystoles. There were no electrocardiographic or roentgenographic machines available. During the period that the condition of painful feet was prevalent a few sudden deaths occurred in young adults for which there was no obvious cause. Some of these may have been the result of cardiac involvement.

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the development of the paralysis. The deep reflexes of the knee and ankle were normal, except in the few severe and prolonged cases where muscle weakness or paralysis was present. There were no other demonstrable abnormal reflexes. Loss of vibratory sense over the malleoli was common. Deep tenderness of the muscles of the feet or legs was infrequently present. Partial anesthesia of the involved parts was the rule, and in very severe cases, the anesthesia was complete. The legs, thighs, external genitalia, and abdomen were anesthetic in a few severe cases.

A small percentage of patients had amblyopia and an ophthalmoscopic examination showed optic atrophy. Visual fields were done on a majority of these patients with an eye involvement, revealing contraction of varying degrees; the ophthalmologist in the camp stated that he believed that 25 percent had organic eye involvement. Others, including the author, believe this estimate to be too high. The ophthalmological findings have been described by Bloom et al. (8).

#### LABORATORY EXAMINATIONS

Facilities were not available to perform blood chemistry examinations. Hemoglobin content, red and white cell counts, and differential counts were done on the 115 severely ill patients in the experimental group. The only hematologic abnormality noted was slight secondary anemia present in most of these. No abnormalities were found in routine urine examinations.

#### TREATMENT COURSE AND PROGNOSIS

No treatment was available not even analgesics, during the first 3 months of the disease. The patients tried a variety of self-administered remedies, such as massaging the feet or immersing them in hot or cold water, but none of the procedures were beneficial and heat definitely aggravated the pain.

It was decided to attempt injections of normal saline (30 to 40 cc.) into the sacral canal because the suffering of the afflicted was so great. (Injections of amounts sufficient to cause local discomfort had been used with some success in cases of sciatica.) Several patients stated they obtained relief from the pain immediately following injections and remained free for several days. However, optimism about this form of treatment was cut short, when a patient volunteered the information that the pain in his hands was also cured. This incident raised the question as to whether or not a psychogenic factor was a part of the syndrome. A few patients with painful feet received quinine therapy for malaria and stated that while under treatment the pain in their feet became less severe. Quinine was given to some

patients with painful feet who did not have malaria. Some patients said their pain was less severe from such therapy but others did not improve.

Based on the assumption that the disease might be caused by a water-soluble vitamin deficiency, cultures of yeast were made in a thin watery rice gruel in an effort to obtain some vitamin B. Patients were given a few tablespoonfuls each day without definite results. Obviously very minute quantities of vitamins could be obtained by this crude method.

The Japanese decided to investigate the conditions at Cabanatuan prison camp, about 1 February 1943, approximately 5 months after the appearance of the disease. A Japanese physician, formerly an instructor in Physiology at the University of Mukden, was sent to the camp and under his direction a board of 8 American medical officers was convened for the study. Approximately 115 of the most severe cases of painful feet, were selected for investigation. Some were bedridden, or perhaps one should say floor-ridden because of suffering from pain and starvation. Patients were divided into groups of 10 to 15. One group, used as controls, received no treatment except placebos, a second group received liver extract, a third thiamine chloride, a fourth an injectable form of inorganic phosphate, a fifth vitamin C, a sixth nicotinic acid, a seventh injections of normal saline into the sacral canal, and an eighth all the treatments given to groups two to seven, inclusive. The Japanese physician told the board what drugs and medicine he had available and those which were to be used. It was obvious that some of the medicine to be used would probably be valueless, but the camp physicians were agreeable in the hopes of obtaining a reasonable supply of thiamine, which, it was believed, was the principal substance needed to prevent or cure the disease. The thiamine chloride furnished by the Japanese was an aqueous solution for subcutaneous injection and contained 1 mg. of thiamine per 2 cc. of solution and in order to obtain an effective dosage a large-volume injection had to be given. This procedure was very uncomfortable for the patients, since they had practically no subcutaneous fat. An arbitrary daily dose of 10 mg. was used since the supply was limited. The author does not recall the doses of ascorbic or nicotinic acid prescribed.

Unfortunately, the experiment was allowed to continue for only 6 or 8 weeks, which was too short a time to obtain definite clinical results. Some of the patients who received thiamine, both in the experiment and among other hospital patients, appeared to improve a little faster than those who did not receive it. Evaluation was further complicated by the fact that the general diet of the camp was improved about 2 months before the experimental study began.

On the improved diet, from December 1942 to December 1943, almost all cases of nutritional edema and painful feet were either cured or notably improved. Limited amounts of thiamine, nicotinic acid, and ascorbic acid were available. However, at the end of the period an appreciable number of persons still complained of painful feet. It was suspected that some were using this complaint dishonestly to keep from working on the farm, which was operated by the American prisoners after 1 December 1942. Nutritional edema again became prevalent shortly after December 1943 and there were numerous recurrences and exacerbations of the painful feet syndrome.

A long-term follow-up of these cases was impossible. However, one patient who had a very severe case of painful feet beginning in October 1942 was observed in the AAF Regional Hospital, Santa Ana, Calif., in January 1946, at which time he still complained of shooting pains and hyperesthesia of the soles of the feet to a minor degree, although the burning aching pain had disappeared. In July 1949 this patient was again observed at Randolph Air Force Base, and he complained of shooting pains in the feet several times daily and dull aching pain in the balls of the feet after walking. Other patients are known to have been hospitalized for recurrences at this late date.

#### OTHER DEFICIENCY DISEASES AND DEATH RATES

Other nutritional deficiency diseases appeared in the camp population of 8,000 to 9,000 men at about the same time that the painful feet syndrome occurred. Pellagra and xerophthalmia were prevalent, and a few cases of scurvy and a greater number of riboflavinosis cases were recognized. During June and July 1942 the death rate was about 35 per day, primarily from malaria and dysentery with superimposed starvation. Quinine for treating malaria became available in adequate amounts the latter part of July 1942, reducing the death rate by half. For the succeeding 4 months the death rate remained approximately

protein in the form of carabao meat, and (c) the purchase of food for the needy from a welfare fund, made possible by monthly donations of American officers from the pay received from the Japanese beginning in December 1942.

#### CASE REPORT

A 33-year-old medical officer first noticed a slight, dull, burning, aching pain in the balls of both feet about 1 November 1942. The pain gradually increased in severity, interfered with sleep, and reached a maximum in about 30 days

Shooting pains and hyperesthesia of the dorsal surfaces of toes was moderately severe. There was dull red mottling of the skin with slight superficial desquamation of the skin over the distal half of the feet. The dorsal surfaces of the toes became hypersensitive, making the weight of bed clothes on the feet unbearable. The knee and ankle jerks were normal and there was no motor paralysis or muscle weakness. Administration of 10 mg of thiamine subcutaneously every other day was begun 2 weeks after the onset of symptoms and this was continued for 3 months. Approximately 1 month after onset of symptoms the diet was improved. At the end of 3 months the burning, aching pains in the balls of the feet were no longer present; shooting pains only occurred occasionally and were relatively mild. The hyperesthesia of the toes was alleviated considerably but was not eliminated entirely. Mottling and desquamation of the skin persisted. The feet remained clumsy as a result of a sensory disturbance characterized by feeling "dead." There was no interference with ordinary walking, but it was apparent subjectively and objectively that he was having difficulty in maneuvering his feet in trying to run. After the pain disappeared the sensory disturbance persisted for about 3 months.

#### DISCUSSION

It is difficult to determine the exact etiologic factor in this condition because of the complicated etiologic factors and the numerous diseases superimposed upon the starvation. However, it is presumed that the disease is a result of vitamin deficiencies. The patients showed many abnormalities described by Williams (6) in experimentally induced vitamin B<sub>1</sub> deficiency in humans, such as restricted physical activity, depressed mental states, apathy, irritability, generalized weakness, and loss of memory. Keys (7) has described many of these same symptoms in starvation with essentially adequate vitamin intake. Neither of these authors mentioned aching pains in the balls of the feet, although Williams (6) did describe tenderness of the soles. The mental depression, irritability, and apathy could also be explained by the very unhappy situation of the prisoners. Even very minor requests were refused by the Japanese, who exercised every opportunity to humiliate and harass the prisoners and deliberately starved them slowly to death. Many persons, not suffering from painful feet evidenced the other general symptoms described.

Muscular paresis and paralysis were almost entirely absent in these cases, whereas motor involvement is the rule in classical beriberi. On the other hand, sensory disturbances were much more severe than experienced in beriberi. By an improved diet, there was improvement or cure in all patients with rare exceptions, and the recovery was more rapid when therapeutic doses of thiamine chloride supplemented the diet. Six months after treatment with 500 mg. of thiamine chloride and an improved diet, one medical officer was cured of moderately severe painful feet. From the clinical observations and the response to food and vitamin B, it is believed that the disease is a peripheral

neuritis, primarily of sensory nerves (a few patients did have muscle paralysis late and therefore must be considered to have had polyneuritis). Since the clinical picture differs from that of classical beriberi, it is concluded that a deficiency of vitamin B<sub>1</sub> alone could not account for the disease. Some other deficiency must play a part in the cause. However, since patients who received thiamine improved more rapidly than those not receiving it, the consensus was that the deficiency of vitamin B<sub>1</sub> was the principal factor in the etiology. Page (2) is of the opinion that deficiency of one or more elements of the B complex, closely allied to the P-P factor, is responsible for the syndrome. Cruickshank (3) also believes that lack of nicotinic acid and possibly riboflavin results in this symptom complex. In pellagrous humans it is known that, although involvement of the central nervous system is the rule, peripheral nerve lesions are rare. It has been suggested that in those cases in which peripheral nerve involvement has been described, there was probably a concurrent vitamin B<sub>1</sub> deficiency.

Labernadie (1) believed that syphilis was the etiologic factor in his case, but *Treponema pallidum* can be excluded as the causative agent in the cases described in this paper.

Cold was not a factor in the cases occurring in the Philippines.

Poor appetite was quite common, but can be explained by illness and the quality of the food items. The majority ate all they received and wanted more, but many, although free from disease, were unable to eat the meager diet.

The fact that recurrences of the symptoms are reappearing as long as 7 years after the initial attack, in spite of a balanced diet, indicates that irreparable damage has been done to the nerves or the nerve cells, or that the capacity to assimilate certain essential foods has been impaired.

#### SUMMARY

A condition of painful feet which occurred in Americans who were prisoners of war in the Philippines and who had been on a deficient diet for approximately 9 months is described. Several deficiency diseases were prevalent, but this syndrome was outstanding and could be easily recognized. This condition has been noted previously in the Orient and always under conditions of inadequate dietary regimes. It is presumed that the syndrome is the result of vitamin deficiencies, and the symptoms and signs are due to a neuritis primarily of sensory nerves. It is believed that the deficiency of thiamine is the principal but not the only factor responsible for the syndrome.

## REFERENCES

1. LABERNADIE, V. G. F.: Apropos d'un cas de "burning of feet." *Far East. A. Trop. Med.*, Tr. Seventh Congress (1927) 1: 13-16, 1928.
2. PAGE, J. A.: Painful-feet syndrome among prisoners of war in Far East. *Brit. M. J.* 2: 260-262, Aug. 24, 1946.
3. CRUICKSHANK, E. K.: Painful feet in prisoners-of-war in Far East; review of 500 cases. *Lancet* 2: 369-372, Sept. 14, 1946.
4. BURGFSS, R. C.: Deficiency diseases in prisoners-of-war at Changi, Singapore, February 1942 to August 1945. *Lancet* 2: 411-418, Sept. 21, 1946.
5. HARRISON, G. F.: Nutritional deficiency, painful feet, high blood pressure in Hong Kong. *Lancet* 1: 961-964, June 29, 1946.
6. WILLIAMS, R. D.; MASON, H. L.; WILDER, R. M.; and SMITH, B. F.: Observations on induced thiamine (Vitamin B<sub>1</sub>) deficiency in man. *Arch. Int. Med.* 66: 785-799, Oct. 1946.
7. KEYS, A.: Human starvation and its consequences. *J. Am. Dietet. A.* 22: 582-587, July 1946.
8. BROOM, S. M.; MERR, E. H.; and TAYLOR, W. W.: Nutritional amblyopia in American prisoners of war liberated from Japanese. *Am. J. Ophth.* 29: 1248-1257, Oct. 1946.





# Administration of Procaine Intravenously

## IV. In General Surgery and Obstetrics<sup>1</sup>

JESSE F. BROWN, *Captain, MC, U. S. A.*<sup>2</sup>

THE valuable pharmacologic properties of procaine administered intravenously are: elevation of the pain threshold; depression of nerve transmission; relief of smooth muscle spasm; and depression of the myocardial hyperirritability that may arise during anesthesia. It is through recognition of these properties and their proper application that procaine infusion has become a therapeutic procedure with a broad range of usefulness. Its most common use is for the relief of pain. Even small doses of procaine given subcutaneously raise the threshold of pain at distant sites. The general analgesic action of procaine following its subcutaneous injection was measured by Bigelow and Harrison (1) and the effect was found to be nearly equivalent to the relief after acetylsalicylic acid, namely, a ceiling rise about 35 percent above the normal threshold value. This action of procaine is greater after its intravenous injection, and the degree of analgesia is proportional to the blood level obtained. It has been used to provide analgesia for burns, while changing surgical dressings, and to control postoperative pain.

In obstetric patients it has been used alone or in combination with other agents for general anesthesia (2) (3) (4) (5). In these patients the infusion was started after labor was well established. The rate of administration, which varied from 10 mg. per minute at the onset of labor to 200 mg. per minute to achieve total anesthesia for delivery and repair, was regulated according to the severity of the pains. Throughout the second stage the rate was slow, but for delivery and subsequent repair operations it was increased. Labor pains were relieved without disturbance of consciousness. The total dose of procaine ranged from 0.3 to 9.7 gm. Administration was continuous throughout labors that lasted from 35 minutes to 15 hours. Allen (2) considered this to be

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the ideal obstetric analgesic since it (*a*) offers convenient, flexible, and rapidly controllable analgesia; (*b*) does not inhibit uterine contractions, and even appears to hasten delivery; (*c*) is apparently harmless to mother and child; (*d*) is free from the depressant action of narcotics and barbiturates on mother and child; and (*e*) is not associated with headache, nausea, disorientation, or other uncomfortable sequelae. Recovery is almost immediate. The procedure is not, however, without danger. In some persons the anesthetic and convulsive doses are nearly the same. Therefore certain women cannot be given complete analgesia without danger of convulsions unless a second drug is given to depress the central nervous system.

Procaine infusion has also been used for surgical anesthesia. Scattered reports indicate that it gives anesthesia suitable for most minor procedures and for major procedures which do not require muscular relaxation. Graubard and Peterson (6) used it successfully for repair of lacerations, but found it unsatisfactory for the reduction of fractures. Trifari and Martin (7) have used it in combination with curare for minor plastic surgery and in abdominal surgery. They summarized the advantages to be gained from intravenous procaine anesthesia and recommended its continued trial. Its growing popularity is based on the ease and simplicity of administration, its freedom from undesirable side effects, and the prolonged analgesia following its use. Postoperative respiratory depression, vomiting, and malaise, which are so commonly seen after morphine or other types of general anesthesia are eliminated. With procaine control of pain generally outlasts therapeutic doses of morphine. Finally, postoperative care is simple because consciousness is not affected unless large amounts are used and recovery of consciousness is rapid. In spite of these advantages procaine infusion has not been widely adopted for general anesthesia. Blood levels of procaine which are necessary to achieve unconsciousness are on the borderline of toxicity and untoward reactions are feared. Allen and Safford (8) have stated: "While retaining procaine for intravenous analgesia, we have abandoned it for general surgical anesthesia, because of rare unpredictable collapse without convulsions and without known means of prevention."

Another application of the general analgesic property of procaine is its combination with other agents for general anesthesia. It has been suggested that by depressing the central nervous system with other general anesthetic agents, the likelihood of convulsions is reduced and the margin of safety is thereby widened (9). Although all central nervous system depressants undoubtedly will provide some degree of protection, the barbiturates are specific in this action (10). The most practical combination has been found to be pentothal-procaine. With these drugs the hypnotic action of one supplements the

analgesic action of the other. The advantage to be gained from elevating the pain threshold during pentothal anesthesia by a drug that does not depress respiration is apparent. Knight (12) (13) prefers the fractional dosage technique of administration, using the ratio of 25 mg. pentothal, 10 mg. of procaine, and 10 units of intocostin. Nitrous oxide and oxygen are administered as soon as the patient loses consciousness. Fraser (13) and Fraser and Kraft (14) have reported over 1,500 cases without mishap. They balanced the use of pentothal-procaine with various other forms of anesthesia according to the requirements of relaxation. Their technique is a continuous drip of 0.1 to 0.2 percent pentothal with 0.05 to 0.1 percent procaine. For post-operative sedation the ratio of pentothal and procaine is reversed. In all types of operation where relaxation is not an essential requirement, they found pentothal-procaine an excellent combination of anesthetic agents. Our own experience in a few well-selected cases has confirmed its utility.

An example of the use of the sympatholytic property of procaine infusion is found in the treatment of gynecologic disorders. Allen (2) suggested its use for treatment of threatened abortion. No report of its use in this condition has been seen. Its use has been suggested for relaxation of the pathologic contraction ring of Bandl and in dystocia. At the University of Texas procaine infusions have been used in treating a large series of patients with menstrual cramps (15).

The use of intravenous procaine as a cardiac depressant during general anesthesia is of special interest (16). It is paradoxical that all of the commonly known inhalation agents have a depressant effect on the central nervous system but produce a hyperirritability of the heart muscle and cardiac conduction system as a result of which mechanical, chemical, and reflex stimuli may provoke a variety of arrhythmias, some of which may threaten life. Arrhythmias are common with all anesthetic agents. Although the abnormal rhythm often consists of premature contractions or displacements of the pacemaker, the more serious arrhythmias occur more frequently than is usually suspected. Burstein (17) has suggested that anesthesiologists use direct-reading electrocardiography as a means of detecting serious disorders in cardiac rhythm that may otherwise pass unnoticed. Because of the diversity of causes of cardiac irregularities, it is not reasonable to expect one form of treatment to correct them all. Stimuli which are capable of disturbing cardiac rhythm may arise from many sources (15). When possible, the precipitating causes should be avoided, or otherwise removed as in the observance of frequent rest periods in operations on the heart. These measures do not, however, reverse the underlying cardiac hyperirritability caused by the anesthetic agent.

Attempts to overcome cardiac hyperirritability by the use of procaine stem from the work of Beck and Mautz (18) who applied procaine solution topically to the heart and pericardium in operations on the heart. This was found to prevent extrasystoles caused by surface stimuli, to abolish auricular fibrillation when applied over the auricles; and to prevent ventricular fibrillation. Methods of counteracting cardiac hyperirritability went through a period of laboratory development during which the effects of procaine infusion were compared with those of other drugs. Procaine infusion was first used to control cardiac rhythm in anesthetized human patients by Burstein. Following the success of this method he used it prophylactically before inducing anesthesia. Of over 500 patients so treated none with a regular cardiac rhythm developed arrhythmias during operation and none with abnormal rhythm preoperatively showed any increase in arrhythmia.

The experimental work that preceded the clinical application of procaine infusion for the control of cardiac rhythm is extensive. The method used was to sensitize the heart of the experimental animal to chloroform or cyclopropane and then produce arrhythmias by injecting epinephrine intravenously. Drugs being tested were injected in an attempt to stop the arrhythmia, or were given prophylactically to prevent it. Burstein (19) believed he could successfully treat ventricular fibrillation produced in this manner by subsequently injecting procaine intravenously. Stutzman, Allen, and Orth (20) reproduced his results, but disagreed on their interpretation, when electrocardiograms showed a rapid ventricular tachycardia. Allen, Stutzman, Slocum, and Orth (21) pointed out that the essential conditions necessary for the production of cardiac arrhythmias by this method are the presence of the anesthetic agent and epinephrine in the heart and an intact sympathetic pathway between the heart and a brain center above the pons (21). They tested a series of drugs of known pharmacologic action and showed that the arrhythmias might be abolished or inhibited at several sites of action. Procaine, carbon dioxide, and quinidine gave protection because of myocardial depression; F883 and ergotamine, by their sympatholytic action; yohimbine, through its adrenolytic action; and morphine by producing either functional decerebration or myocardial depression. Effective amounts of the two most practical drugs that completely protected the heart were 16 mg. in the case of procaine and 15 mg. in the case of quinidine per kilogram of body weight. The effective dose of morphine was 8 mg. per kilogram. Investigation of this problem is progressing with prisco-line, dibenamine, and other new drugs.

Procaine infusion has been shown to be both effective and safe for control of the heart rhythm during surgical anesthesia. Two recent

analgesic action of the other. The advantage to be gained from elevating the pain threshold during pentothal anesthesia by a drug that does not depress respiration is apparent. Knight (12) (13) prefers the fractional dosage technique of administration, using the ratio of 25 mg. pentothal, 10 mg. of procaine, and 10 units of intocostin. Nitrous oxide and oxygen are administered as soon as the patient loses consciousness. Fraser (13) and Fraser and Kraft (14) have reported over 1,500 cases without mishap. They balanced the use of pentothal-procaine with various other forms of anesthesia according to the requirements of relaxation. Their technique is a continuous drip of 0.1 to 0.2 percent pentothal with 0.05 to 0.1 percent procaine. For post-operative sedation the ratio of pentothal and procaine is reversed. In all types of operation where relaxation is not an essential requirement, they found pentothal-procaine an excellent combination of anesthetic agents. Our own experience in a few well-selected cases has confirmed its utility.

An example of the use of the sympatholytic property of procaine infusion is found in the treatment of gynecologic disorders. Allen (2) suggested its use for treatment of threatened abortion. No report of its use in this condition has been seen. Its use has been suggested for relaxation of the pathologic contraction ring of Bandl and in dystocia. At the University of Texas procaine infusions have been used in treating a large series of patients with menstrual cramps (15).

The use of intravenous procaine as a cardiac depressant during general anesthesia is of special interest (16). It is paradoxical that all of the commonly known inhalation agents have a depressant effect on the central nervous system but produce a hyperirritability of the heart muscle and cardiac conduction system as a result of which mechanical, chemical, and reflex stimuli may provoke a variety of arrhythmias, some of which may threaten life. Arrhythmias are common with all anesthetic agents. Although the abnormal rhythm often consists of premature contractions or displacements of the pacemaker, the more serious arrhythmias occur more frequently than is usually suspected. Burstein (17) has suggested that anesthesiologists use direct-reading electrocardiography as a means of detecting serious disorders in cardiac rhythm that may otherwise pass unnoticed. Because of the diversity of causes of cardiac irregularities, it is not reasonable to expect one form of treatment to correct them all. Stimuli which are capable of disturbing cardiac rhythm may arise from many sources (15). When possible, the precipitating causes should be avoided, or otherwise removed as in the observance of frequent rest periods in operations on the heart. These measures do not, however, reverse the underlying cardiac hyperirritability caused by the anesthetic agent.

anesthesia to serve as a prophylactic agent against cardiac dysfunction seems illogical. When, however, disturbance in rhythm occurs during anesthesia because of stimuli arising from surgery, a single injection is frequently adequate to restore normal rhythm, particularly if the stimuli are thereafter discontinued. Burstein originally recommended 50 mg. but has recently advocated a single dose of 100 mg. That this dose is not excessive is seen from the reports of two patients who inadvertently received 1 gm. intravenously without ill effect when 100 mg. was intended. The author gives a continuous infusion of a 0.2 percent solution slowly throughout an operation with an increased rate at times of increased stimuli or when arrhythmias are detected. Procaine infusion is given regularly to patients undergoing thoracic operations and to patients who are poor surgical risks. Other patients are given single injections of procaine when it seems indicated. In using procaine prophylactically it is difficult to judge the results except in comparison with the expected course of the patient.

#### CONCLUSIONS

Procaine infusion is a valuable means of relieving pain and muscle spasm. In combination with other agents it may be used as an anesthetic. It is a means of preventing and correcting disturbances in cardiac rhythm during anesthesia. Its availability does not relieve the surgeon of his obligation to handle tissues gently nor the anesthesiologist of his responsibility to practice his art according to the best principles. It does, however, add to the latter's armamentarium a procedure that further contributes to the safety of anesthesia, particularly in patients who are poor surgical risks.

#### REFERENCES

1. BIGELOW, N., and HARRISON, I.: General analgesic effects of procaine. *J. Pharmacol. & Exper. Therap.* 81: 368-373, Aug. 1944.
2. ALLEN, F. M.: Intravenous obstetrical anesthesia; preliminary report. *Am. J. Surg.* 70: 283-290, Dec. 1945.
3. JOHNSON, K., and GILBERT, C. R. A.: Intravenous procaine for obstetrical anesthesia. *Anesth. & Analg.* 25: 133-140, July-Aug. 1946.
4. Personal communication from Dr. John W. Winter.
5. SALVINI, A., and FERRERO, F.: Intravenous "Recorealin" (procaine) analgesia in labor. *Riv. Ital. Ginec.* 30: 397-407, 1947, Abstr.: *J. Obst. & Gynaec. Brit. Emp.* 55: 830, Dec. 1948.
6. GRAUBARD, D. J., and PETERSON, M. C.: Therapeutic uses of intravenous procaine. *Anesthesiology* 10: 175-187, March 1949.
7. TRIFARI, L. M., and MARTIN, S. J.: Civilian and military aspects of intravenous anesthesia. *Anesth. & Analg.* 26: 45-63, March-April 1947.
8. ALLEN, F. M., and SAMPSON, P. K.: Animal experiments with procaine and related drugs. Footnote, *Anesth. & Analg.* 27: 121-136, May-June 1948.
9. BURSTEIN, C. L.: Misuse of adrenalin and coramine. *Am. J. Surg.* 73: 102-103, July 1949.

articles have described in detail the effect of procaine on the heart. Uhley (22) gave 50 mg. per kilogram of body weight of procaine to dogs maintained under sodium pentothal anesthesia. The resulting changes in the electrocardiograms consisted of prolongation of the PR and QRS intervals signifying a mild degree of auriculoventricular and interventricular block. There were also changes in QRS, T-S and T configurations, suggesting some alteration in the depolarization and repolarization patterns. Long (10) injected varying doses of procaine (4 to 80 mg. per kilogram of body weight) rapidly into dogs anesthetized with sodium pentobarbital and made frequent estimations of the blood concentration of procaine as well as continuous electrocardiographic tracings. In this manner electrocardiographic changes were correlated with blood concentrations of procaine. No changes occurred in the electrocardiographic pattern, heart sounds, or blood pressure when the dose was 4 mg. per kilogram of body weight, but as the dose was increased a series of progressive changes occurred that were maximal when the blood level was at its peak and regressed as the blood level fell. All of the electrocardiographic changes were reversible and returned to the control state in from 1 to 3 minutes. Above a dose of 50 to 60 mg. per kilogram of body weight there was a tendency for arrhythmia to occur, and at 60 to 80 mg. per kilogram of body weight, 3 out of 20 dogs developed ventricular fibrillation. Some evidence was presented that damaged heart muscles are more sensitive to procaine than are normal heart muscles. The significance of this fact, if confirmed, deserves further exposition because it implies that clinical response is best where the need for treatment is greatest.

Although doses comparable to those used in animal experimentation are never used clinically, improvement in abnormal cardiac rhythm is often experienced following procaine infusions. The mode of action of procaine is believed to be the summation of several effects (23). Electrocardiographic studies have shown that procaine can cause a displaced pacemaker to revert to the sinus node. By depressing activity of the extrinsic cardiac nerves, it reduces extracardiac nervous stimulation. Suppression of the adrenal medullary secretion prevents reflex liberation of epinephrine. Conduction through the bundle of His and the ventricular musculature is slowed and, to a lesser extent, conduction is slowed through the auriculoventricular node and possibly through the atrial musculature. The refractory period after systole is prolonged, and the excitability of the myocardium to electric stimulation is diminished. The result of these combined actions is decreased disturbance of the cardiac mechanism from a variety of insults which arise during operation.

Because of the rapidity with which procaine is destroyed after intravenous injection, the use of a single injection before inducing

# Recent Advances in Plastic Surgery

GORDON S. LETTERMAN, M. D.<sup>1</sup>

WILLIAM C. MELOY, M. D.<sup>1</sup>

THE increasing importance of and the medical profession's rapidly growing interest in plastic and reconstructive surgery, is indicated by the many papers on this subject which have appeared in recent months. This article is a brief review of a few of the more significant advances in this specialty made during the last 2 years. Those topics of practical interest to the military surgeon are featured. More comprehensive and detailed reviews of the recent literature have been written by Letterman and Brown (1) (2) and Letterman and Meloy (3).

## COMPOSITE GRAFT

Brown, Cannon, et al. (4) utilize a free composite graft obtained from the ear and composed of two surfaces of skin and intervening cartilage, for the repair of nasal defects. In a single operation a comparatively large bulk, which is ideally suited for the repair and reconstruction of free tissue of the columella, ala, and tip of the nose, is transferred. Restorations with the composite graft match the nasal border in texture, contour, color, and appearance. The defect of the ear is easily repaired by direct closure or local flap. Armstrong (5) employs composite grafts in the reconstruction of full thickness losses of the lower eyelid. This type of graft undoubtedly will prove advantageous in the restoration of other facial features.

## MANDIBLE

Byars (6) (7) deals with the preservation and restoration of mandibular function and contour. An internal bar fixation method is described which meets the immediate postoperative needs following mandibular resection. It maintains the fragments of the mandible in their original position and therefore in the optimum position for future bony reconstruction. Kanthak and Hamm (8), Padgett et al. (9), and Dingman (10) discuss the correction of mandibular deformities. Blocker (11) (12) (13) emphasizes the importance of bone

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- 10 LONG, J. H.; OPPENHEIMER, M. J.; WESTER, M. R.; and DURANT, T. M.: Effect of intravenous procaine on heart. *Anesthesiology* 10: 401-415, July 1949.
- 11 KNIGHT, R. T.: Present developments in combined anesthesia. *J. Michigan M. Soc.* 46: 90-91 Jan. 1947.
- 12 KNIGHT, R. T.: Curare in anesthesia. *J. Indiana M. A.* 40: 125, Feb. 1947.
- 13 FRASER, R. J.: Intravenous pentothal-procaine analgesia. *Anesth. & Analg.* 27: 150-163, May-June 1948.
- 14 FRASER, R. J., and KRAFT, K.: Pentothal-procaine analgesia. *Anesth. & Analg.* 27: 282-286, Sept.-Oct. 1948.
- 15 SLOCUM, C. H.: Personal communication.
- 16 BURESTIN, C. L.: Treatment of acute arrhythmias during anesthesia by intravenous procaine. *Anesthesiology* 7: 113-121, March 1946.
- 17 BURESTIN, C. L.: Utility of intravenous procaine in anesthetic management of cardiac disturbances. *Anesthesiology* 10: 133-144, March 1949.
- 18 BECK, C. S., and MAITZ, F. R.: Control of heart beat by surgeon, with special reference to ventricular fibrillation occurring during operation. *Ann. Surg.* 106: 525-537 Oct. 1937.
- 19 BURESTIN, C. L.; MARANGONI, B. A.; DEGRAFF, A. C.; and ROVENSTINE, E. A.: Laboratory studies on prophylaxis and treatment of ventricular fibrillation induced by epinephrine during cyclopropane anesthesia. *Anesthesiology* 1: 167-186, Sept. 1940.
- 20 STUTZMAN, J. W.; ALLEN, C. R.; and ORTH, O. S.: Failure of procaine to reverse cyclopropane-epinephrine ventricular fibrillation. *Anesthesiology* 6: 57-60, Jan. 1945.
- 21 ALLEN, C. R.; STUTZMAN, J. W.; SLOCUM, H. C.; and ORTH, O. S.: Protection from cyclopropane-epinephrine tachycardia by various drugs. *Anesthesiology* 2: 503-514, Sept. 1941.
- 22 CHLEY, M. H., and WILBURNE, M.: Effect of intravenous procaine on electrocardiogram of dog. *Am. Heart J.* 36: 576-581 Oct. 1948.
- 23 RITTRICH, N. M., and POWERS, W. F.: Intravenous procaine in thoracic surgery. *Anesth. & Analg.* 27: 181-196, July-Aug. 1948.



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## MANDIBLE

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on the face as for any other part of the body. Brown and Fryer (33) emphasize the basic principles in the repair of compound facial injuries. Peacher (40) enumerates the speech disturbances resulting from maxillofacial injuries acquired in World War II. Ivy (41) has described the repair of healed facial defects with low neck pedicle grafts. Blocker and Weiss (13) stress the importance of the patient's personality and adjacent features in reconstruction of facial defects.

#### SCALP AND CRANIOPLASTY

Peacher, Cannon, and Brown (42) evaluate the use of tantalum, bone, and cartilage in the repair of skull defects. Bone is the best material with which to repair the majority of defects. Tantalum is sometimes necessary for the repair of very large defects and in other situations where bone is contra-indicated. Cannon et al. (43) stress the necessity of a good viable resurfacing of the scalp prior to the closure of the defect. Kazanjian and Webster (44) review the treatment of extensive losses of the scalp.

#### FACIAL PARALYSIS

Owens (45) (46) compares the surgical methods available for correction of facial paralysis and is convinced that the procedure of choice is the insertion of fascial strips. Brown and McDowell (47) (48) use loops of fascia lata connecting the temporal muscle and face in the region of the mouth and columella. Adams (49) employs multiple muscle transplantations to correct facial paralysis. None of these workers advise the use of tantalum, wire, or wire mesh.

#### DECUBITUS ULCER

White and Hamm (50) advocate the use of widely undermined flaps of gluteal skin and subcutaneous tissue to cover the defects left by the block excision of the decubitus ulcer. Kostrubala and Greeley (51) feel that simple excisions of the entire pyrogenic membrane and flap repair do not remove the immediate cause of bedsores. They stress the importance of removing the bony prominences underlying the ulcer. The complete excision of the ulcer includes a considerable portion of the underlying bone which shows changes ranging from simple fibrosis to chronic osteomyelitis.

#### SCARS AND KELOIDS

Block and Tsuzuki (52) have found a comparatively high incidence of keloids and hypertrophic scars in Japanese sustaining burns from atomic bomb explosions. Considering the treatment of these cases and the incidence of keloid formation among Japanese people, it seems impossible to evaluate the significance of direct ionizing action and

neutron radiation, in the production of these scars. Trusler and Bauer (53) believe that application of continued pressure to a new scar and radiation therapy are important prophylactic measures in dealing with the repair of keloids and hypertrophic scars.

### GENITALIA

Young and Benjamin (54) advocate the use of a one-stage operation for hypospadias repair. A free split graft obtained from the antero-medial surface of the arm is used to form the lining of the tube. This procedure has been found more satisfactory than operations involving flap repairs. Price and Penna (55) have studied the effectiveness of drugs in preventing postoperative penile erections. The pre- and post-operative use of stilbesterol is recommended. Davis and Berner (56) describe the reconstruction, following total avulsion of the skin from the penis and scrotum.

### NOSE

Byars (57) describes in detail the correction of the more frequent nasal deformities. Standard rhinoplasty procedures are based upon the planned alteration of the size, shape, and interrelationship of the component nasal parts. The patient's facial features, and even more important, the whole patient must be given careful consideration whenever any change in the nasal structure is contemplated. Steffensen (58) reviews the methods for correcting deviations of the anterior-inferior margin of the septum and warns especially about the injudicious use of submucous septal resection. Maliniac (59) describes a compressive suspension splint for the management of comminuted nasal fractures. The instrument combines narrowing of the dorsum with forward traction of the depressed fragments. Rubin, Robertson, and Shapiro (60) use implants of polyethylene for nasal, chin, and forehead restorations. The substance is chemically inert and does not appear to have an unfavorable effect on body tissues. Safian (61) offers an excellent critical and authoritative review of the more recent articles on rhinoplastic surgery.

### CLEFT LIPS AND PALATES

Blair and Robinson (62) elaborate upon certain facts pertinent to cleft lip closure. The aim of the surgical procedure is to obtain a symmetrical lip, free-breathing, and a natural-appearing nose without suture marks or prominent scars. Blair's repair involves a modified Mirault flap. Brown, McDowell, and Byars (63) present the basic surgical principles and describe in detail the procedures involved in double cleft lip repair. Brown and McDowell (64) describe their repair of the single cleft lip. Fogh-Anderson (65) gives an historical

account of the Stein-Estlander-Abbe operation Kazanjian (66) deals with the common secondary deformities developing in cleft lip and palate cases. Dorrance and Bransfield (67) find the "push back" operation necessary in almost every palate case.

## REFERENCES

1. LETTERMAN, G. S., and BROWN, J. B. Review of reconstructive surgery of the face—1947. *Laryngoscope* 58: 532-532, June 1948.
2. LETTERMAN, G. S. and BROWN, J. B. Plastic and Reconstructive Surgery. *Cyclopedia of Medicine*. F. A. Davis Co., Philadelphia, Pa. 1948.
3. LETTERMAN, G. S., and MELOY, W. C. Plastic surgery in the United States: review of 1948 literature. (In press.)
4. BROWN, J. B.; CANNON, B.; LISCHER, C. E.; and DAVIS, W. B.: Composite free grafts of skin and cartilage from the ear. *J. A. M. A.* 134: 1205-1206, Aug. 16, 1947.
5. ARMSTRONG, C. J. Use of composite graft in reconstructive surgery of lower eyelid. *Plast. & Reconstruct Surg* 3: 79-83, Jan. 1948.
6. BYARS, L. T. Preservation and restoration of mandibular function and contour. *Ann Surg* 127: 863-879, May 1948.
7. BYARS, L. T., and McDOWELL, I. Preservation of jaw function following surgery and trauma. *Surg., Gynec. & Obst.* 84: 870-877, April 1947.
8. KANTHAK, F. F., and HAMM, W. G.: Surgical treatment of growth deformities of mandible. *South Surgeon* 14: 147-153, Feb. 1948.
9. PADGETT, E. C., ROBINSON, D. W., and STEPHENSON, K. L.: Ankylosis of the temporomandibular joint. *Surgery* 24: 426, 1948.
10. DINGMAN, R. O. Surgical correction of developmental deformities of the mandible. *Plast. & Reconstruct Surg* 3: 124-146, March 1948.
11. BLOCKER, T. G., JR. Principles of reconstruction of defects about the face. *Texas State J. Med.* 42: 527-531, Jan. 1947.
12. BLOCKER, T. G., JR.: Cancellous bone grafts to the jaw. *Surg., Gynec. & Obst.* 84: 553-561, April 15, 1947.
13. BLOCKER, T. G., JR., and WITTS, L. R. Use of cancellous bone in repair of defects about the jaws. *Ann Surg* 123: 622-640, April 1946.
14. DELK, M. B., and LETTERMAN, G. S. Fractures of mandibular symphysis with report of cases. *J. Oral Surg* 6: 316-323, Oct. 1948.
15. BARCLAY, L. T., GORDON, S. D., and CAMPBELL, H. Management of jaw fractures. *Surg., Gynec. & Obst.* 84: 973-978, May 1947.
16. BROWN, J. B.: Closure of surface defects with free skin grafts and with pedicle flaps. *Surg., Gynec. & Obst.* 84: 862-865, April 15, 1947.
17. KERNWEIN, G. A.: Recovery of sensation in split thickness skin grafts. *Arch Surg* 56: 459-474, April 1948.
18. BAXTER, H., and ENTIN, M. A.: Experimental and clinical studies of reduced temperatures in injury and repair in man. III. Direct effect of cooling and freezing on various elements of the human skin. *Plast. & Reconstruct Surg* 3: 301-334, May 1948.
19. BUNNELL, S., DOHERTY, E. W., and CURTIS, R. M.: Ischemic contracture, local, in hand. *Plast. & Reconstruct Surg* 3: 424-433, July 1948.
20. CLIFTON, E. E.: Unusual innervation of intrinsic muscles of hand by median and ulnar nerve. *Surgery* 23: 12-31, Jan. 1948.
21. CANNON, B.; LISCHER, C. E.; and BROWN, J. B.: Open jump flap repairs of lower extremity. *Surgery* 22: 335-340, Aug. 1947.

22. CANNON, B.; LISCHER, C. E.; DAVIS, W. B.; CHASKO, S.; MOORE, A.; MURRAY, J. E.; and McDOWELL, A.: Use of open jump flaps in lower extremity repairs. *Plast. & Reconstruct. Surg.* 2: 336-341, July 1947
23. CONVERSE, J. M.: Plastic repair of extremities by nontubulated pedicle skin flaps. *J. Bone & Joint Surg.* 30-A: 163-194, Jan. 1948
24. LETTERMAN, G. S.: Plexiglas splints: use in pedicle flap attachments. *Plast. & Reconstruct. Surg.* 3: 553-559, Sept. 1948
25. LEWIN, M. L.: Resurfacing procedures in compound injuries of lower extremities. *Ann. Surg.* 128: 66-79, July 1948.
26. BROWN, J. B.; CANNON, B.; LISCHER, C.; DAVIS, W. B.; and MOORE, A.: Surgical substitutions for losses of external ear. *Surg., Gynec. & Obst.* 84: 192-196, Feb. 1947.
27. AUFRICHT, G.: Total ear reconstruction: preliminary report. *Plast. & Reconstruct. Surg.* 2: 297-306, July 1947.
28. CONWAY, H.; NEWMANN, C. G.; GELB, J.; LEVIRIDGE, L. L., and JOSEPH, J. M.: Reconstruction of external ear. *Ann. Surg.* 128: 226-239, Aug. 1948
29. PETER, L. A.: Reconstruction of auricle with diced cartilage grafts in vitalium ear mold. *Plast. & Reconstruct. Surg.* 3: 653-666, Nov. 1948
30. CANNON, B.: Some recent developments in plastic surgery. *S. Clin. North America*, 1106-1112, Oct. 1947.
31. SCHUESSLER, W. W., and FILMER, G. A.: Method of restoration of cilia of eyelids. *Plast. & Reconstruct. Surg.* 2: 345-347, July 1947.
32. SPAETH, E. B.: Reconstruction of upper lid. *Surg., Gynec. & Obst.* 84: 804-808, April 15, 1947.
33. SHERMAN, A. E.: Reconstruction of orbital floor defects. *Surg., Gynec. & Obst.* 84: 799-803, April 15, 1947
34. PICKRELL, K. L., and CLARK, E. H.: Tattooing of corneal scars with soluble pigments. *Plast. & Reconstruct. Surg.* 2: 44-59, Jan. 1947.
35. GREER, J. N., JR.: Rise of buccal mucosa in restoration of orbital socket. *Am. J. Ophth.* 31: 445-453, April 1948
36. CALLAHAN, A.: Reconstruction of cantlid. *Tr. Am. Acad. Ophth.* 52: 486-496, May-June 1948.
37. BROWN, J. B., and CANNON, B.: Repair of major facial injuries. *Ann. Surg.* 126: 624-632, Oct. 1947
38. BROWN, J. B., and FRYER, M. P.: Management of compound facial injuries. *Am. J. Surg.* 75: 625-630, Nov. 1948.
39. IVERSON, P. C.: Surgical removal of traumatic tattoos of face. *Plast. & Reconstruct. Surg.* 2: 427-432, Sept. 1947
40. PEACHEL, W. G.: Speech disorders in World War II. *Plast. & Reconstruct. Surg.* 2: 267-277, May 1947
41. IVY, R. H.: Repair of facial defects by low-neck pedicle flaps. *Plast. & Reconstruct. Surg.* 1: 119-123, Sept. 1946.
42. PEACHER, W. G.; CANNON, B., and BROWN, J. B.: Repair of skull defects. *Surgery* 22: 611-618, Oct. 1947
43. CANNON, B.; BROWN, J. B., and PEACHER, W. G.: Repair of scalp defects. *Surgery* 22: 619-626, Oct. 1947.
44. KAZANJIAN, V. H., and WEBSTER, R. C.: Treatment of extensive losses of scalp. *Plast. & Reconstruct. Surg.* 1: 360-385, Nov. 1946.
45. OWENS, N.: Reevaluation of implantation of fascial strips through masseter muscle for surgical correction of facial paralysis. *Ann. Otol., Rhin. & Laryng.* 57: 55-64, March 1948.

- 46 OWENS, N. Implantation of fascial strips through masseter muscle for surgical correction of facial paralysis. *Plast & Reconstruct Surg.* 2: 25-26, Jan. 1947
47. BROWN, J. B., and McDOWELL, F.: Support of the paralyzed face. *J A M A* 135: 18-20, Sept 6, 1947
48. BROWN, J. B., McDOWELL, F.; and FRYER, M. P.: Facial paralysis supported with autogenous fascia lata. *Ann Surg* 127: 858-862, May 1948
- 49 ADAMS, W. M. Multiple muscle substitution for correction of facial paralysis. *Am J Surg* 74: 654-664, Nov 1947
50. WHITE, J. C., and HAMM, W. G.: Primary closure of bedsores by plastic surgery. *Ann Surg* 124: 1136-1147, Dec 1946
- 51 KOSIRUTALA, J. G. and GREELEY, P. W. *Problem of decubitus ulcers in paraplegics*. *Plast & Reconstruct Surg* 2: 403-412, Sept 1947.
- 52 BLOCK, M. A., and TSUTSUKI, M. Observations of burn scars sustained by atomic bomb survivors: a preliminary study. *Am J Surg* 75: 417-431, March 1948
53. TRUSLER, H. M., and BAUER, T. B.: Keloids and hypertrophic scars. *Arch Surg* 57: 539, 1948
- 54 YOUNG F., and BENJAMIN, J. A. Repair of hypospadias with free inlay skin graft. *Surg Gynec & Obst* 86: 439-451 April 1948
- 55 PRICE, R. A., and PENNA, O. J. Effectiveness of drugs in preventing post-operative penile erections. *Surgery*, 24: 950-952, Dec 1948
56. DAVIS, A. D., and BEEVER, R. E. Primary repair of total avulsion of skin from penis and scrotum. *Plast & Reconstruct Surg* 3: 417-423, July 1948
- 57 BYARS, L. T.: Surgical correction of nasal deformities. *Surg. Gynec & Obst* 84: 65-77, Jan 1947
58. STIFFENSEN, W. H. Reconstruction of nasal septum. *Plast & Reconstruct Surg* 2: 66-71, Jan 1947
- 59 MALINIAC, J. W. Compressive suspension splint for severely comminuted fractures. *Plast. & Reconstruct Surg* 2: 341-345, July 1947
60. RUBIN, L. B.; ROBERTSON, G. W., and SHAPIRO, R. N. Polyethylene in reconstructive surgery. *Plast & Reconstruct Surg* 3: 586, 1948
- 61 SAFIAN, J. A critical review of recent literature on rhinoplasty. *Plast & Reconstruct Surg* 2: 463-473, Sept 1947
62. BLAIR, V. P., and ROBINSON, R. R. Primary closure of harelip. *Surg, Gynec & Obst* 86: 502-503, April 1948
63. BROWN, J. B., McDOWELL, F., and BYARS, L. T.: Double clefts of lip. *Surg, Gynec. & Obst* 85: 20-29, July 1947.
64. BROWN, J. B., and McDOWELL, F.: Surgical repair of cleft lips. *Arch Surg* 56: 750-757, June 1948
- 65 FOGH-ANDERSEN, P.: Stein Eslander-Abbe operation. *Plast. & Reconstruct. Surg* 3: 186-188, March 1948
- 66 KAZANJIAN, V. H. *Eslander-Abbe operation in treating secondary harelip deformities and defects of upper lip resulting from cancer*. *Plast & Reconstruct. Surg* 2: 307-325, July 1947
67. DORRANCE, G. M., and BRANSFIELD, J. W. Studies in anatomy and repair of cleft palate. *Surg, Gynec. & Obst.* 84: 878-885, April 15, 1947.



# Temporary Lower Extremity Cineplasty

ROY C. ROUNDS, Major, U. S. A. F. (MC)<sup>1</sup>

THE Italians were the first to use cineplastic prostheses for lower extremity amputations. Although they have reported excellent functional results using quadriceps motor tunnels, the method has never been popular in this country. In selected patients with amputations of the upper extremity where delicacy of motion is more important than power of motion, the cineplastic prosthesis is commonly used. In the lower extremity, lack of any need for delicate motor function and the fact that modern artificial legs are so satisfactory mechanically, precludes the use of cineplastic devices.

The case presented here is unusual because a lower extremity cineplastic procedure without an amputation was performed as a means of preserving quadriceps muscle strength.

## CASE REPORT

The patient was struck by shell fragments on 9 September 1944 in France. He sustained multiple wounds of the lower extremities, the right upper extremity, and the chest with severely comminuted fractures of the distal end of the right humerus and of the left femur. The lower third of the left quadriceps femoris muscle was completely avulsed. Infection appeared in the left femur, and in spite of repeated sequestrectomies and skin grafts, drainage persisted from several sinuses about the site of the fracture. Solid union of the femoral fragments occurred, however, 15 months after injury. A quadricepsplasty, which was an essential step in restoring function to the extremity, was repeatedly postponed because of the infection. In the meantime, wasting and contracture of the quadriceps muscle occurred. For this reason a quadriceps cineplastic procedure was performed well above the infected area. When healed, a molded leather cuff to grasp the calf of the leg was made. From the cuff a leather "quadriceps tendon" was attached to a plastic spindle passed through the motor tunnel. With this apparatus the patient was able to perform quadriceps setting exercises against gradually increased resistance and, in about 2 months, he had acquired sufficient strength to extend the leg momentarily against the force of gravity (fig. 1). He was also able to discard the brace he needed previously to stabilize his knee while walking (fig. 2).

<sup>1</sup> William Beaumont General Hospital, Fort Bliss, Tex.



In the case of the second patient the final healing was delayed because the fibula was not resected (figs 94a and 94b). The fracture

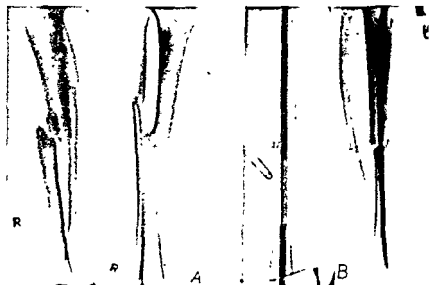


Figure 94 a and b.

united quickly and osteosynthesis was apparently stable. During weight bearing the patient complained of pains at the fracture site. A roentgenogram (fig. 94c) showed marked rarefactions next to the

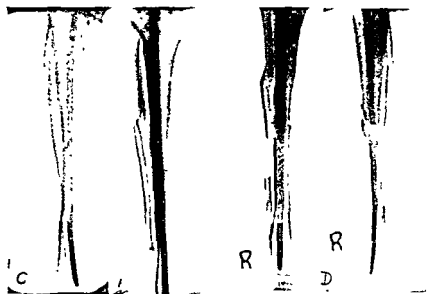


Figure 94 c and d.

nail point. The fibula was resected and the leg put in a U-shaped plaster splint and the patient began weight bearing. Eight weeks later the fracture had united (fig. 94d) and 4 weeks after that the nail was extracted.

If the fibula had been resected when the osteotomy was performed the fracture would have united much sooner.

Surgeons in military hospitals were too liberal with nailing operations. Out of seven nailed fractures of the tibia only three were suitable for nailing and only a relatively stable osteosynthesis could have been expected in the others.

The operative site, in all cases, had been primarily sutured (some without drains), although the original wounds had been healed only 2 to 4 months. All these cases, with the exception of one with a stable osteosynthesis, resulted in chronic suppurations, sequestra formation, and in one case (in which the wounds had not been opened) an osteomyelitis with abscess at the entrance site of the nail and suppuration of the prepatella bursa.

A stay in the hospital for from 10 to 16 months was necessary except in one case that united primarily; the results were decidedly poor and inferior to those which could have been obtained with conservative methods.

The officiousness and impatience of the surgeon is typical in the following two cases.

In a 15-month-old gunshot fracture (fig. 95a) the wounds of which had been healed for 2 months, the fibula was resected. The surgeon, however, failed to reduce and fix the fracture: diathermy was used, and when no callus formation was observed after 4 weeks (not abnormal under the circumstances) the fracture site was exposed, the fracture ends, which were closed by connective tissue, were freshened and united by only one nail which was far too short (fig. 95b). Drainage of the fracture cleft toward the calf, suture, and plaster cast followed. The wound had to be opened 8 days later at which time several small sequestra were ejected. The nail was removed 4 months after the operation although no callus was observed because the wounds were still infected. The fracture cleft was still visible (fig. 95c) and the fracture still movable. Three months later the fistula closed and after the leg was put in a walking cast for 2 months the fracture united. The final result was a shortening of 3 cm. and ankle and knee joints stiffened 50 percent.

In the preceding case as in the following case the nail was useless. Figure 96a is a roentgenogram of a 13-month-old gunshot fracture, the wounds of which had been healed for 2 months. The same surgeon who performed the operation in the preceding case performed a fibula resection when the fracture was still movable but the leg was

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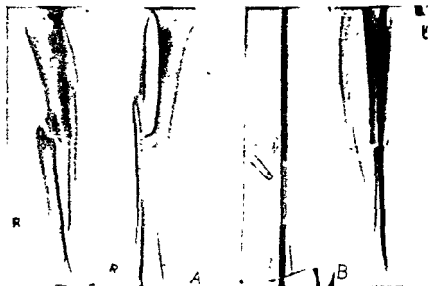


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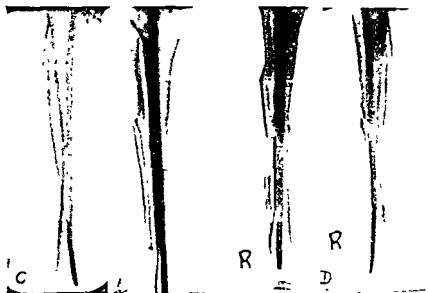


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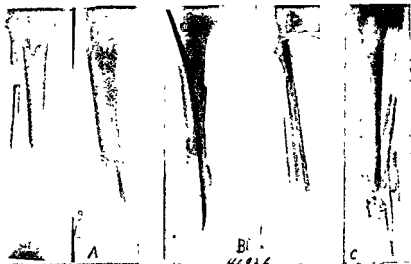


Figure 95.

not immobilized in a plaster cast. An open marrow nailing was performed 4 weeks later. On this occasion "part of the wall of the disrupted fragment had to be removed as being an obstacle to proper adaptation." By doing this the nail laid laterally in the proximal fragment and the fracture ends were pushed together causing a shortening of 4 cm. (fig 96b). The sutured operative wounds became infected and several sequestra were ejected. The leg was put in a plaster cast and in doing this a serious infection of the marrow cavity was avoided. The distal fragment showed a distinct loosening of the bone structure. The nail was removed 4 months after the operation



Figure 96.

because the wounds were still fistulous. Although the fracture was springy, a Volkmann splint was applied, the result being a slight antecurvation; the leg united in a valgus position with a shortening of 4 cm.; the further results were a stiff ankle joint, and the knee movable between  $180^{\circ}$  and  $100^{\circ}$  (fig. 96c). These impediments could have been avoided if the fracture had been properly reduced after resection of the fibula and the leg put in a walking cast.

In an effort to obtain a better fixation of the fracture and a quicker elimination of infection, tibia fractures were nailed without exposing the fracture site, but instead the sequestrum was removed by enlarging the fistula and a closed nailing was performed. A quicker reemployment of the patient has resulted in some instances but it must be admitted that similar results could have been obtained without the nail. Nailing was of no material advantage in fractures less than 3 months old. If conservative methods had been employed the time of treatment would have been shorter and the final result just as good. The author had only 3 out of 11 fractures where full mobility of the joints was obtained. Suppurations occurred, especially in cases in which approximation sutures were used.

It may be said that although these difficulties could have been encountered if conservative treatment had been used; these conditions are an ever-present danger in gunshot fractures.

Nailing does not always offer a clear-cut advantage even when the fracture is suitable for nailing and the osteo-synthesis is perfectly stable. This fact is illustrated by the following cases.

In a 10-day-old infected gunshot fracture (fig. 97), an attempt was made to obtain a better fixation and to control the suppuration by use of the marrow nail. During the operation not only the transversely located splinters were removed, but also those bridging over the medial side of the fracture, although they were connected with the periosteum. It was necessary then to push the fracture together after nailing, and this caused a shortening of 3 cm. Instead of the nail having a favorable influence on the suppuration, abscesses developed both at the entrance site of the nail and



Figure 97.

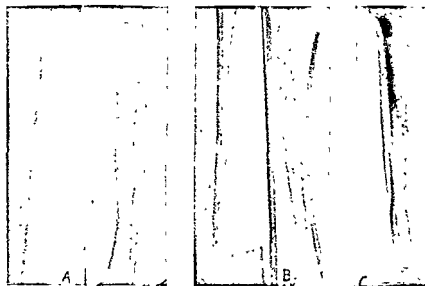


Figure 99 a, b, and c

4½ weeks after the accident, this is also true if a closed nailing is performed as is done in simple fractures. Figure 99b is the same fracture after nailing. Conditions were not aseptic and abscesses and suppurations followed, which necessitated additional plaster casts. The nail was extracted 5 months later.

Six months after the operation (1 month after the removal of the nail) the fracture had united but the wounds were still fistulous (fig 99c). The patient was released from the hospital 10 months after the operation with an impediment of the ankle joint and the knee motion amounting to 80° to 180°. A better result would certainly have been obtained without nailing. Tibia fractures due to gunshot injury which are still movable may be satisfactorily reduced by conservative methods.

It must therefore be concluded that the marrow nail offers no advantages in chronically infected gunshot fractures of the tibia and one should abstain from nailing because of the many dangers, even though exposure is necessary because of sequestra formation.

If early union of the fibula hinders the proper reduction of the fragments or if it is the reason for insufficient callus formation the re-section with subsequent application of plaster casts will fit the purpose and will not constitute a hazard.

Fistulous fractures of the tibia 5 to 18 months old were nailed in 4 instances. The fibula had united in all of them and if we examine the roentgenograms closely it will be seen that a final union could

have been obtained by resection and proper reduction. This obvious solution was, as is so often the case, not attempted. In the case illustrated by figure 100 the author was not impressed by the fact that a pseudarthrosis had existed for 18 months, but was overenthusiastic about the marrow nailing method. In this case the nail was the cause of late complications which would very likely have been avoided had the nail not been used.

The patient wore a hinged splint, the knee joint was freely movable, but the ankle joint was slightly stiffened. After his discharge several sequestra were ejected, the last one 14 days before readmittance to the hospital. Figure 100*a* is a roentgenogram made on readmittance. After osteotomy of the fibula and mobilization of the fracture we were successful in nailing the fracture without exposure of the fracture site. The fracture was clinically solid but there was a slight gap at the fracture cleft (fig. 100*b*). A small abscess developed at the entrance site of the nail (which was left open) 10 days after the operation. Except for this abscess, healing was uneventful and the patient began using the limb 3 weeks after the operation; the fistula had then closed. Weight bearing caused the gap at the fracture cleft to close (fig. 100*c*) and a small sequestrum was ejected. The wounds closed and the patient was then treated as an out-patient 2½ months after the operation. The fistula broke open sometime later and secreted a dark fluid. After 5 months union was sufficient to permit the withdrawal of the nails; the outer nail had rusted on both edges so there remained only a 3 mm. bridge at the fracture cleft, and the inner nail also had rusted. The nail had obviously obtained a firm hold in the

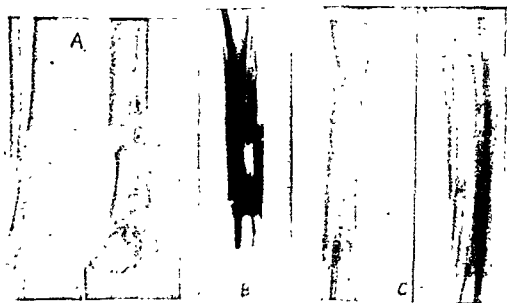


Figure 100 *a*, *b*, and *c*.



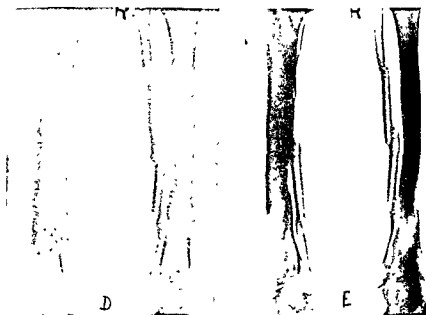


Figure 100 d and e.

callus that closed the marrow cavities in spite of the unfavorable location of the fracture, there were no rarefactions noticed at the point of the nail. A sequestrum had formed through the fracture cleft (fig 100d). This sequestrum was removed after the entrance

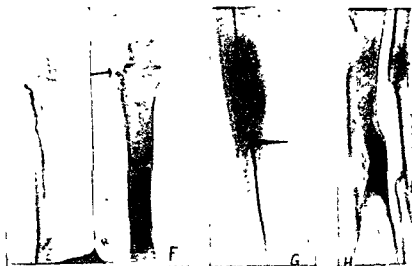


Figure 100 f, g, and h.

wound of the nail had healed by flattening of the bone. Six months after the operation the wound had healed and the patient was discharged from the hospital (fig. 100e).

Sometime after his discharge from the hospital the patient had pain and swelling at the fracture site which subsided when one of the wounds broke open. No sequestra were ejected. Upon readmission to the hospital 20 months after the operation no sequestra could be detected, but a contrast medium, introduced by approach from the tuberosity of the tibia revealed a fistula in the marrow cavity that reached to the middle of the tibia (fig. 100f). The fistula could not be traced as far as the fracture cleft at the time of operation, and a methylene blue solution injected through a urethral catheter did not appear at the fracture cleft (fig. 100g). The bone was then chiseled at the upper section of the canal and the fistula exposed (fig. 100h). The patient was discharged from the hospital 6 weeks after the last operation with wound healed.

There is no doubt that this long stay in the hospital would have been avoided if the nail had not been used.

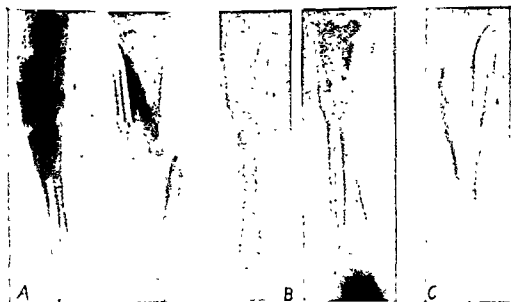


Figure 101.

In a 7-month-old fracture (fig. 101a) in which the roentgenogram suggested the beginning of a pseudarthrosis, we believe that a simple resection would have been better and would have led to quicker union. Connective scar tissue between the fracture ends which also closed the marrow cavities was found at time of operation. The fibula was not resected and when the nails were removed 4 months after the operation because of a dark-colored discharge which indicated rust, the fracture had not united (fig. 101b) (the nails had oxidized at the

fracture site). The wounds healed soon after the nails were removed and 4 months later the fracture had united sufficiently to allow the replacement of the walking cast by a Unna bandage (fig. 101c).

The author maintains that these fractures would have united satisfactorily if the fibula had been resected and a nonoperative reduction performed followed by subsequent application of walking casts, because they were not pseudarthroses but ununited fractures. To prove this contention attention is directed to figure 102a which is similar to the case illustrated by figure 101 in which the diagnosis of a pseudarthrosis seems fully justified. This "pseudarthrosis" united after the resection of the fibula and 6 weeks in a plaster cast (fig 102b). The patient was able to perform his duties 8 weeks after resection. This is one example out of many such cases treated by the author. We have always been successful except in cases having serious bone defects.

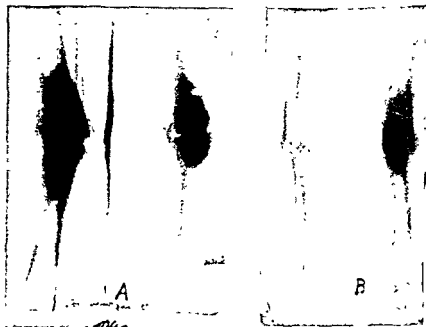


Figure 102.

The nailing of old gunshot fractures of the tibia that are in bad position and the wounds just healed should be done only if it is a transverse or oblique fracture in the middle third and a stabile osteosynthesis is certain. Even if these conditions prevail great care should be exercised and it is recommended that nailing be done only when satisfactory position cannot be obtained by nonoperative methods after the resection of the fibula. The wounds must be drained and the

skin should not be sutured. An additional plaster cast will be necessary until danger of infection has passed.

In all other tibial gunshot fractures nailing should not be performed. They will become solid as a rule by placing the limb in a cast after the fragments have been brought to proper abutment.

If the fracture fails to unite one of the time-honored pseudarthrosis operations should be performed even though a pseudarthrosis exists or is imminent, if at least 1 year has elapsed after the healing of the wounds.

The nailing of old fistulous tibia gunshot fractures should not be performed even though a pseudarthrosis exists or is imminent. Nailing has no advantages and it constitutes an additional hazard of complications. The double nail is particularly susceptible to corrosion by suppuration and this type of nail further sustains the suppuration and is obviously the cause of sequestra.

#### GUNSHOT FRACTURES OF THE HUMERUS

Boehler advises against marrow nailing of pseudarthroses of the humerus because it has no advantage over the other methods, especially with respect to callus formation, and because it failed in case of atrophic bone and because of the danger of spreading infection throughout the entire marrow cavity.

In 47 cases of marrow nailing of old fractures of the humerus due to gunshot injuries an osteomyelitis occurred in 3 cases: a 3-month-old fistulous fracture; a 19-month-old pseudarthrosis, the wounds of which had been healed for 5 months; and in a 2½-year-old pseudarthrosis that had been operated on 13 months after the wounds were healed. The spreading of infection, doubtless, was caused by improper technique and failure to open the wounds soon enough. The spreading of infection into the marrow cavity can be avoided by immediately opening the wounds wide as soon as an infection develops, even if the osteosynthesis is not completely stabile.

A primary closure of wounds is always dangerous in old gunshot fractures because one is never on the safe side regarding infections even if the fistulae are closed for more than a year. Only four out of eight of that type of pseudarthroses united primarily. On the other hand, three out of five fractures which had been nailed 3 to 5 months after the closure of the fistulae and sutured primarily with adequate drainage united without infection. Postponing the operation apparently had no advantage.

The suppuration was, if no osteomyelitis occurred, chronic in all cases where the wounds had not been widely opened and where only a simple drain had been used. In contrast to this six pseudarthroses, which had been operated upon 4 to 6 weeks after the wounds had

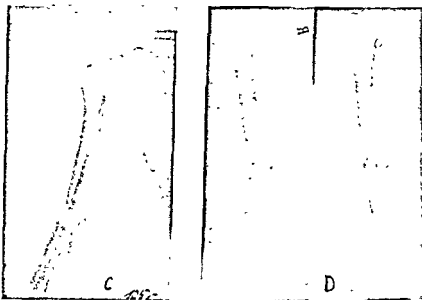


Figure 103 c and d.

healed secondarily so the plaster cast was removed. The slight gap of the fracture had been pushed together by use of the limb (fig. 103c) and 6 months after the operation the fracture had united (with a slight angulation) (fig. 103d) so the nail could be withdrawn. The patient had been detailed to work during the movement exercise period and when he was discharged to the troops there was a limitation of extension of the elbow of  $25^{\circ}$ , but the shoulder was freely movable. The elbow joint was nearly stiff when admitted to the hospital.

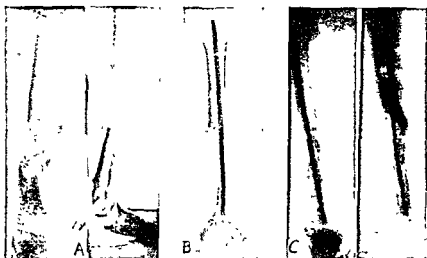
In another case the stay in the hospital was more eventful. This case was a 2-year-old pseudarthrosis (fig. 104a) where a bone graft operation had been performed 9 months after the injury but had been unsuccessful. Because the wounds had been healed for more than a year, the wound at the fracture site was sutured and drained. The wounds were opened 3 days later because the patient had fever. Although no osteomyelitis or sequestra formation occurred, the patient had pain and fever whenever exercises were begun, so the plaster cast was left in position. As the wound at the fracture site continued to suppurate, 7 months after the operation it was decided to remove the nail although the roentgenogram showed insufficient callus formation (fig. 104c). The arm was left in the plaster cast 6 weeks longer and the callus solidified to such extent that exercises could be started (fig. 104d). Eleven months after the operation the fistulae were entirely closed and the patient was discharged, but the mobility



Figure 104.

of the joints was not notably improved, which was to be expected in a 2-year-old fracture.

No reliance can be placed on the solidity of small callus bridges. This was demonstrated in the nailing of an 8-month-old fistulous pseudarthrosis (fig. 105a) the outer nail of which had turned 90° so the inner nail could not be used. The fracture appeared solid (fig. 105b). Eight days later the fracture could be moved longitudinally and was somewhat distracted (fig. 105c). After 9 months in an abduction cast the fracture became so solid by the formation of a callus bridge that the nail was removed (fig. 105d). The wound had

*Figure 106.*

exercises were begun, and a year postoperatively the fracture was solid enough to permit removal of the nail (fig. 106c). The shoulder joint was freely movable, but the elbow joint had a mobility of only  $70^{\circ}$  to  $100^{\circ}$ .

Pseudarthroses of the middle third of the humerus are very suitable for nailing even if the distal fragment is short. An example of this was a 22-month-old fistulous pseudarthrosis (fig. 107a), the fracture of which had united so much 5 months after nailing that the abduction cast was removed. The nail was visible in the open wound at the elbow and acted as a drain. The wound at the fracture site

*Figure 107.*

healed quickly. The wound at the elbow healed, but the nail was not withdrawn because of insufficient callus formation. The patient was drafted for labor service and was not seen again for  $2\frac{3}{4}$  years when he returned to the hospital because of an abscess on the elbow (fig. 107b). Since the fracture was united by bony union, the nail was removed when the abscess was incised. The elbow joint was movable between  $90^{\circ}$  and  $160^{\circ}$ . This certainly may be considered a good result.

In this type of fracture the nail must be introduced exactly at the upper edge of the olecranon fossa and the end of the nail bent slightly to prevent the distal fragment from slipping off the nail. If these points are observed it will be unnecessary to use a spiral spring or other special measures. If the nail is not introduced exactly in the middle the bone may be split and the osteosynthesis will not be stable.

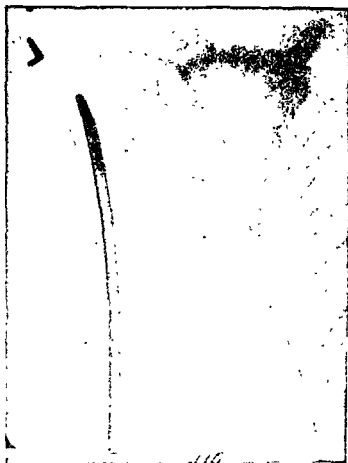


Figure 108.

It is recommended that gunshot fractures of the humerus, especially if they are fistulous, be nailed by approach from the distal side because of the ever-present danger of infection. By a distal approach the entrance spot of the nail will be the deepest point and the nail will form a perfect drain if the wound is left open.



This will not be possible in cases of fractures in the proximal third because of the danger of the nail slipping out of the head causing a pseudarthrosis. This actually happened in the case illustrated by figure 108 which had been nailed immediately after the injury. The case came to the author for treatment a year later. A union was secured by means of a staircase-shaped freshening and wire suture.

The authors and many others have attempted to nail such ununited fractures from the proximal side but complications have developed in every case.

One pseudarthrosis, the wounds of which had been healed for 2 months, became infected and resulted in suppurations with perforations toward the olecranon fossa; another, the wounds of which had been healed for a year, had an infection beneath the deltoid muscle; and in two other fistulous pseudarthroses the distal atrophic fragment was split, one having an infection of the elbow joint.

Although all four came to a bony union, the nail proved to be of no advantage. The more simple method and one more likely to be successful (especially if the bone is atrophic) is to point the distal

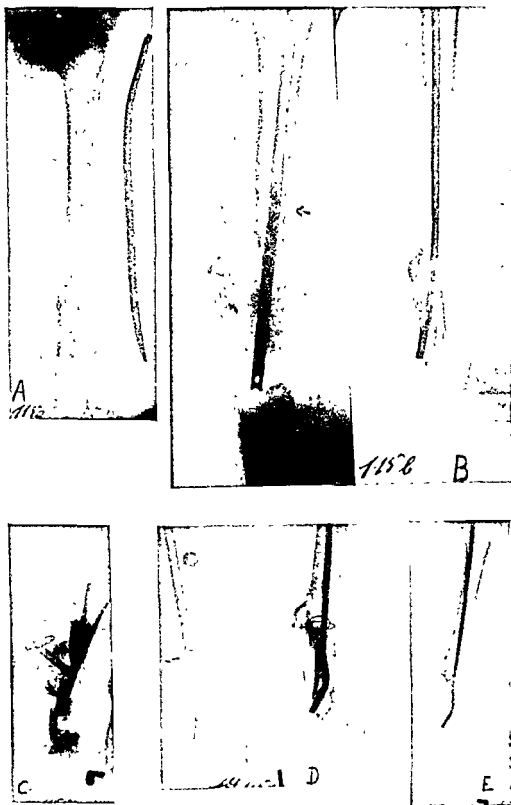
atrophic bone and cause the resorption of the fracture ends and result in faulty union.

The advantage of nailing old fractures of the humerus in which an uneventful healing is not assured is that it can be performed while the wounds are suppurating. We have nailed 14 fractures of this kind. Sequestra formation is expected in this type of fracture especially if compound, but it would occur if conservative methods were used. Osteomyelitis developed in one instance and this could have been avoided.

In dealing with old fractures it is important that only sequestra be removed, the splinters should be left in position and the fracture not be freshened; the removal of the splinters destroys the protective granulation dam. It is also important that the osteosynthesis be stable, that the wounds be properly drained, and that neither the entrance site of the nail nor the wounds be sutured to avoid infection.

The nailing should be performed, if possible, by approach from the distal side to avoid infection of the marrow cavity. The nail will act as a drain and its entrance site will be the lowest point. If it is necessary to nail from the proximal side it will be necessary to apply an abduction cast and to elevate the arm above horizontal until danger of infection has passed.

The following case describes the conditions that may arise in case of an atrophic bone which must be given special consideration.

*Figure 109.*

will not be sufficient, especially if it is fixed with two screws as shown in figure 111a. This was a 12-month-old pseudarthrosis of the ulna with a central luxation of the radius. The wounds were healed 2 months after the injury and 2 months later an operative reduction of the radius and fixation of the ulna by a Lane's plate was performed. As there was but one screw on each side of the plate it did not hold and another luxation of the ulna and a pseudarthrosis developed. The cartilage of the radius head had been entirely destroyed because an extensive resection of the radius head had been made in a previous operation. The connective tissue callosities of the ulna were removed and a marrow nail inserted. The nail jammed in the callus of the distal fragment and had to be cut off (fig. 111b). Although the nail was too short the osteosynthesis was stable and the wounds healed. A plaster splint was applied for 4 weeks after which exercise of the limb was started. Six months after the operation the fracture had united (fig. 111c) and no rarefactions around the tip of the nail were noted. Rotation of the forearm was reduced one-fourth but all other joints were freely movable.

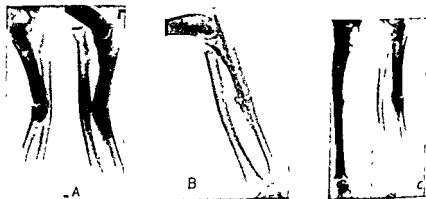


Figure 111.

If the head of the radius is resected too sparingly the longitudinal wire will be of no benefit and the result will be either a distraction and faulty union or a fracture of the nail.

It is the author's opinion that the ulna should not be resected or both bones be nailed after resecting in cases of Monteggia fracture. If the resection is done sparingly a new luxation is likely to occur and if infection develops, especially if both bones are nailed, the outcome will be worse than before the operation. Most of these fractures will unite because the obstruction of the ulna is offset by the distal luxation.

If the fracture of the radius has united but the function of the wrist is seriously hampered by a luxation of the ulna in the distal radio-ulna joint, a resection of the ulna in the shaft and nailing will be useless. The shrinking of the scar at the wrist joint will cause a new distraction of the site of resection and a new pseudarthrosis will develop in spite of the plaster cast. It would be better to resect the styloid process of the ulna.

Two cases of defect pseudarthrosis of the ulna, in which a bone graft had been made, were nailed with the idea that the nail would aid in uniting the graft by holding it in position. (This procedure has been recommended by others but Boehler refutes it because he claims that the graft does not get enough nutrition because of the destruction of the cavity.) Infection developed in both of these cases and a faulty union resulted, although the osteosynthesis was stabile in both.

Because the author saw two cases of tibia pseudarthrosis that resulted in faulty union he refrained from further experiments. The plaster cast assures adequate position of the forearm if left on for about 12 weeks. The idea that the marrow nail might interfere with nutrition of the bone is by no means farfetched. As a matter of fact zones of resorption are usually seen at the wire loops when a graft is used. The patient material of the author was not large enough to draw definite conclusions as to the merits of using the marrow nail, and as we have had good results with the bone graft without it, we are inclined to advise against using the nail when a bone graft is made as any advantage would be offset by danger of infection.

#### SUMMARY

The marrow nail is advantageous in pseudarthroses due to gunshot fracture of both bones of the forearm if a stabile osteosynthesis can be assured. It is necessary to resect wide enough to assure a wide abutment of the bones.

An attempt to achieve this abutment by the addition of a wire loop is dangerous. In case of infection this may cause a gradual fracture and formation of sequestra at the bone ends, especially if the osteosynthesis is not stabile and the bone is atrophic.

Only a longitudinal suture is necessary if the calcareous content of the bone is satisfactory and this should be applied widely. If the osteosynthesis is stabile it can be dispensed with.

If there is a defect pseudarthrosis of one bone, a bone graft is the most satisfactory treatment. An additional marrow nail might interfere with the nutrition of the graft. Resection of the obstructing bone and then nailing both bones is the least desirable method.

will not be sufficient, especially if it is fixed with two screws as shown in figure 111a. This was a 12-month-old pseudarthrosis of the ulna with a central luxation of the radius. The wounds were healed 2 months after the injury and 2 months later an operative reduction of the radius and fixation of the ulna by a Lane's plate was performed. As there was but one screw on each side of the plate it did not hold and another luxation of the ulna and a pseudarthrosis developed. The cartilage of the radius head had been entirely destroyed because an extensive resection of the radius head had been made in a previous operation. The connective tissue callosities of the ulna were removed and a marrow nail inserted. The nail jammed in the callus of the distal fragment and had to be cut off (fig 111b). Although the nail was too short the osteosynthesis was stable and the wounds healed. A plaster splint was applied for 4 weeks after which exercise of the limb was started. Six months after the operation the fracture had united (fig 111c) and no rarefactions around the tip of the nail were noted. Rotation of the forearm was reduced one-fourth but all other joints were freely movable.

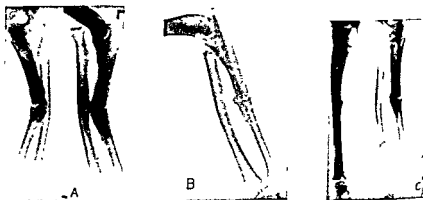


Figure 111

If the head of the radius is resected too sparingly the longitudinal wire will be of no benefit and the result will be either a distraction and faulty union or a fracture of the nail.

It is the author's opinion that the ulna should not be resected or both bones be nailed after resecting in cases of Monteggia fracture. If the resection is done sparingly a new luxation is likely to occur and if infection develops, especially if both bones are nailed, the outcome will be worse than before the operation. Most of these fractures will unite because the obstruction of the ulna is offset by the distal luxation.

If the fracture of the radius has united but the function of the wrist is seriously hampered by a luxation of the ulna in the distal radio-ulna joint, a resection of the ulna in the shaft and nailing will be useless. The shrinking of the scar at the wrist joint will cause a new distraction of the site of resection and a new pseudarthrosis will develop in spite of the plaster cast. It would be better to resect the styloid process of the ulna.

Two cases of defect pseudarthrosis of the ulna, in which a bone graft had been made, were nailed with the idea that the nail would aid in uniting the graft by holding it in position. (This procedure has been recommended by others but Boehler refutes it because he claims that the graft does not get enough nutrition because of the destruction of the cavity.) Infection developed in both of these cases and a faulty union resulted, although the osteosynthesis was stabile in both.

Because the author saw two cases of tibia pseudarthrosis that resulted in faulty union he refrained from further experiments. The plaster cast assures adequate position of the forearm if left on for about 12 weeks. The idea that the marrow nail might interfere with nutrition of the bone is by no means farfetched. As a matter of fact zones of resorption are usually seen at the wire loops when a graft is used. The patient material of the author was not large enough to draw definite conclusions as to the merits of using the marrow nail, and as we have had good results with the bone graft without it, we are inclined to advise against using the nail when a bone graft is made as any advantage would be offset by danger of infection.

#### SUMMARY

The marrow nail is advantageous in pseudarthroses due to gunshot fracture of both bones of the forearm if a stabile osteosynthesis can be assured. It is necessary to resect wide enough to assure a wide abutment of the bones.

An attempt to achieve this abutment by the addition of a wire loop is dangerous. In case of infection this may cause a gradual fracture and formation of sequestra at the bone ends, especially if the osteosynthesis is not stabile and the bone is atrophic.

Only a longitudinal suture is necessary if the calcareous content of the bone is satisfactory and this should be applied widely. If the osteosynthesis is stabile it can be dispensed with.

If there is a defect pseudarthrosis of one bone, a bone graft is the most satisfactory treatment. An additional marrow nail might interfere with the nutrition of the graft. Resection of the obstructing bone and then nailing both bones is the least desirable method.

If there is an imminent pseudarthrosis following a Monteggia fracture it will be necessary to nail the ulna and reduce the luxation of the head of the radius by operation to avoid a faulty union or a fracture of the nail.

If a luxation has existed for more than 6 months it will be necessary to resect the head of the radius and nail the ulna pseudarthrosis. The resection must be wide enough to prevent the radius from becoming obstructive again.

In case of an old luxation in the distal radio-ulna joint the resection of the styloid process will give better results than the resection of the shaft of the ulna and then nailing



# Psychologic Approach to Hard of Hearing Patients

CLARE B. CORNELL, Ph D.<sup>1</sup>

PSYCHOMETRIC tests show that patients with a loss of hearing score high on depression and hysteria and often show tendencies toward hypochondriasis and psychasthenia. They live in a partial or complete auditory vacuum that causes feelings of insecurity and suspicion. The sounds of a normal environment are missing. They misunderstand commands and are accused of being unintelligent. They fail to hear the sound of an approaching automobile until it whizzes past. When they enter a room and see a conversation in progress, they imagine that people are talking about them, because they cannot hear.

## CASE REPORT

A 35-year-old man with over 5 years of service, was acting as manager of a hotel operated by the Army of Occupation and accommodating 500 women, civilian and military. He was happy in his job and popular with guests and military personnel until he received a reprimand from his commanding officer that he was neglecting his duties. About the same time a close friend, who was visiting him one evening, walked out without saying a word. The patient telephoned asking for an explanation. The friend replied, "I sat there while you were working on your books and asked you question after question, but got no reply. If you are going high hat, I'm through with you." It suddenly dawned on him that his hearing was falling. After a check-up, he was transferred to the Audiology and Speech Correction Center at Walter Reed General Hospital.

He appeared extremely depressed, sensitive, and rebellious on arrival at the Center. Psychometric examination revealed rather severe depression and hysteria. The otologic diagnosis was moderate deafness, perceptive type, cause undetermined. An audiometric examination showed a hearing loss for speech of 80 decibels in the right ear, and 40 decibels in the left ear, or a loss of 60 to 65 percent in the right ear and 30 to 35 percent in the left ear. The patient was fitted with an air conduction 22.5 volt hearing aid to the left ear, which afforded normal hearing. He received 4 weeks' auditory training, 5 weeks of lip reading, and 3 weeks of speech correction. The therapeutic results of this program were soon reflected in the personality of the patient. He regained self-confidence and became communicative, friendly, and alert. After 2 months he was given a C. D. D., because of bilateral deafness.

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This case history has been outlined in some detail in order to emphasize the point that a person with a hearing loss, sufficiently severe to interfere with his daily activities, requires sympathetic understanding and skilled medical attention. This is equally true of patients in whom the cause is undetermined and of those with observable trauma received in combat. Whether the hearing loss is sudden or long standing, the net result is an insidious effect on the personality of the patient. There is a certain degree of psychogenic overlay in at least 90 percent of these patients. It is best to treat the patient as having a genuine hearing loss until positive evidence to the contrary has been discovered, even in the case of a suspected malingerer.

Harsh treatment by the doctor only aggravates the condition. The author recently saw a 23-year-old patient weep hysterically in an initial interview. He was asked to explain the outburst, after he had recovered his composure. He replied, "I couldn't help it. I've been kicked around so long that when someone treats me like a human being I just can't take it." His loss of hearing was not severe but, because of unskilled treatment, he had developed an anxiety neurosis resulting in overt hysteria. It is best to give the patient all possible information concerning his deafness, but only when such information is based on a careful examination. Another patient was told that he would eventually lose his hearing completely. The etiology and prognosis of his case did not justify such a statement, but the result was a distressing, although transitory, anxiety.

### CONCLUSIONS

Medical officers should realize that loss of hearing often has serious psychologic complications. Readjustment to the hearing loss involves not only medical and surgical treatment or both, plus furnishing a mechanical aid when necessary, but also careful psychotherapy carried through from the first consultation until the patient is discharged from the hospital and returned to duty or to civil life.



# Amicrobic Pyuria

SPENCER JOHNSON, Captain (MC) U S N<sup>1</sup>

HENRY E. WOLFE, Jr., Lieutenant, junior grade (MC) U S N

**A**MICROBIC pyuria is a disease entity which has been presented in the medical literature for the past two decades under such titles as: sterile pyuria; abacterial pyuria; true infective amicrobic pyuria; and amicrobic pyuria. The latter title is most widely used today. This disease has two outstanding features: No organisms can be isolated from the urinary sediment and the pyuria does not respond to the sulfonamides or the antibiotics.

## ETIOLOGY

Five different possibilities have been presented by McGinn (9) as etiologic agents of this disease: (a) bacteria; (b) bacterial toxins; (c) *Treponema pallidum*; (d) fungi; and (e) viruses. McGinn and other observers believe that the etiological agent is probably an ultramicroscopic organism which falls into either the bacteria or the virus group. Although the bacterial theory receives the most recognition, such writers as Baines (1) and Moore (10) (11) favor an ultramicroscopic virus. Schaufhauser (12) has shown that the disease is easily transmitted from an affected human bladder to the kidney pelves of apparently normal dogs. Syphilis, toxins, and the fungi now receive little recognition as causes and are mentioned only for completeness.

## SYMPTOMS

The outstanding symptoms are dysuria, diuria, nocturia, terminal pain, and terminal hematuria. Several or all of these symptoms may be present. In approximately 50 percent of the cases, nonspecific urethritis may usher in the syndrome. On physical examination suprapubic tenderness and urethral discharge may be the only positive findings. As the disease progresses, the symptoms increase in severity and opiates are often necessary to alleviate the pain over the bladder area. The patient presents no evidence of weight loss but usually has symptoms of a low-grade infection early in the disease. Later,

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cachexia may occur as a result of the severe illness. A high fever is rarely found; usually it is relatively low grade. On occasion, a patient may have acute urinary retention because of the accumulation of enormous numbers of clots within the urinary bladder. Fortunately, such bladder hemorrhage is rare.

Laboratory examinations usually show a normal red blood cell count, unless extreme hematuria is present, a normal white blood cell count, and a normal differential count. The nonprotein nitrogen is within normal limits and the sedimentation rate is usually moderately elevated. Urinalysis usually shows from 1 to 4 plus albumin, negative sugar, 4 plus occult blood, and a sediment containing numerous leukocytes and red blood cells. Bacteria cannot be demonstrated in the urinary sediment. Cultures for *Mycobacterium tuberculosis* and other bacteria are negative, and the injection of guinea pigs with the urinary sediment fails to indicate any evidence of tuberculosis.

On cystoscopic examination, the bladder is extremely contracted, diffusely injected, and the mucosa covered, almost in its entirety, by scattered collections of purulent material. The ureteral orifices are visualized with difficulty and show distortion because of the edema and contraction of the bladder. A retrograde pyelogram usually shows minimal pyelectasis and ureterectasis. As the disease progresses, however, considerable dilatation of the ureters and kidney pelves occurs due to lower urinary tract obstruction. Solomon (14) states that all these changes in the upper urinary tract are reversible if proper treatment with arsenical preparations is undertaken early in the disease. In our case, no pathologic changes in the upper urinary tract were ever noted.

At present there is some controversy concerning recurrence of the disease. Moore (10) (11), in his observations, has found recurrences almost nonexistent although Landes (7) found them to be prevalent. Our patient showed no evidence of recurrence.

Several authors (Landes (7), Baines (1), and others) believe that Reiter's syndrome (which consists of nonspecific urethritis, conjunctivitis, and arthritis) and amicrobial pyuria are different manifestations of the same disease. They base their theory on the fact that patients who have what appears to be amicrobial pyuria, on occasions, show in rapid succession, the conjunctivitis and arthritis described by Reiter in his original paper. Therefore, they believe that both diseases are one and the same, appearing either in the mucous membranes of the eyes, the urethra, or joints.

#### TREATMENT AND THERAPEUTIC TEST

Neosalvarsan was formerly used in the treatment of this disease, but, because of the toxicity of this arsenical, the trend in this country

during the past decade has been to Mapharsen as the arsenical of choice.

A therapeutic test has been described by McGinn (9) and Landes (7), which they believe is extremely reliable in amicrobic pyuria. One injection of Mapharsen (usually 0.02 gm.) or some other arsenical is given; if the patient responds symptomatically within a few days, it is reasonable to suppose that the disease is amicrobic pyuria. Antibiotics as a rule have failed to bring any relief. In the United States, at present, Mapharsen is most widely used, while in the British Isles, Novarsenobenzol is the drug of choice, the dosage recommended being 0.3 gm. every 5 to 7 days for 4 doses. The dosage recommended for Mapharsen by the authors is an initial dose of 0.02 gm. and then 0.04 gm. 3 times a week for 9 doses. A symptomatic improvement follows this dosage in true amicrobic pyuria.

Reports of the use of streptomycin in the treatment of this disease are few, but Hamm (5) has reported some symptomatic relief with the drug.

#### CASE REPORT

An 18-year-old white man was admitted to the Naval Hospital, St. Albans on 3 November 1948, with the chief complaint of pain on urination. Present illness began 2 weeks before admission at which time (2 weeks after intercourse without prophylaxis) he noted severe burning at the end of urination and a moderate purulent discharge. One and a half weeks before admission, the pain at the end of urination had become very severe, dysuria was noted, and the discharge had become serous and "pinkish" in color. Symptoms were minimal at first, but as time progressed, the burning became more severe. He received treatment; at that time, urine examination showed a 1 to 2 plus albumin, 10 to 20 white blood cells per high power field, and an occasional red blood cell. It was then considered that he had acute cystitis (nonvenereal) and he was given sulfadiazine 1 gm. every 4 hours for 1 week. He was relatively asymptomatic for 2 to 3 days, when dysuria and diuria recurred and he was hospitalized.

Past and family histories and a review of systems were entirely within normal limits.

Physical examination revealed normal blood pressure, pulse, and respiration. The patient appeared depressed and chronically ill. Two large solitary lymph nodes were palpable in the left groin. The heart and lungs were within normal limits. A serous urethral discharge was present which showed no evidence of *Neisseria gonorrhoeae* on gram stain. Hemoglobin, 13 gm.; differential count normal; red and white blood cell count normal. Urinalysis showed acid urine, specific gravity, 1.024, 4 plus occult blood, 4 plus albumin, and numerous red blood cells and leukocytes. The three-glass test showed shreds and a cloudiness in all three specimens. On rectal examination the prostate was firm, nontender, and nonnodular. The prostatic secretions were within normal limits on repeated examinations. The Kahn test was reported as negative; the nonprotein nitrogen was 30.5 mg. per 100 cc. blood.

On 5 November 1948, a McCarthy panendoscope was passed without difficulty; the urethra showed no abnormality. The instrument was removed, and a No. 24 Brown-Buerger cystoscope was passed without difficulty. The urinary

bladder showed a distinct inflammatory reaction; the capacity was reduced to 50 cc. The left ureteral orifice could not be visualized because of severe inflammatory reaction on that side, the right orifice was catheterized after repeated attempts. Retrograde pyelogram showed no evidence of gross pathologic changes on the right side, an intravenous pyelogram on the same day revealed good function bilaterally with normal pelvis, calyces and ureters.

The diagnosis was changed on 6 November to acute nonvenereal cystitis.

Penicillin and sulfadiazine were administered immediately after cultures were taken. All cultures showed "no growth" after 48 hours, the cultures for tuberculosis showed "no growth" after several weeks. Penicillin, 100,000 units every 6 hours, and sulfadiazine 1 gm every 4 hours was administered. No alleviation of symptoms was obtained and the sulfadiazine was discontinued after 5 days and the penicillin after 6 days. Subsequently retreatment with penicillin and sulfadiazine gave no relief. Daily urinalyses showed no change in the pyuria and hematuria.

A cystogram on 15 November showed an irregular, contracted bladder with a capacity of 75 cc. and a small left bladder diverticulum measuring  $4 \times 3$  cm. Bilateral retrograde pyelograms made on this date showed no gross pathologic change. Three days following this examination, the patient had a severe conjunctivitis which was considered to be "catarrhal conjunctivitis." Cultures of the eyes were negative for bacteria. The condition responded to symptomatic therapy and after 7 days no further evidence of conjunctivitis was found.

Repeated cultures of the urine for bacteria and acid-fast bacilli were negative. Symptomatic treatment was continued but the patient showed no improvement.

Cystoscopic examination on 9 December showed cystitis was still present and the bladder capacity was still only 100 cc. One week later, bladder capacity was found to be only 75 cc. although a few weeks later it was 125 cc. No residual urine was found at any examination.

On 4 February, because of the very slow symptomatic improvement Mapharsen was given. An initial dose of 0.02 gm was given followed by nine triweekly doses of 0.04 gm; a total of 0.38 gm was given. During the period of treatment, the bladder capacity increased greatly and symptomatic relief was appreciable. At the end of treatment, the bladder capacity was 375 cc., urinalyses were entirely within normal limits, and the patient was completely asymptomatic.

Cystoscopic examinations on 4 March 1949, revealed a normal-appearing bladder with the exception of the left-sided diverticulum. The latter showed no evidence of increase in size. The bladder capacity at this time was 425 cc. There has been no evidence of recurrence to 15 December 1949.

#### REFERENCES

1. BAINES, G. H.: Relation of abacterial pyuria to Reiter's syndrome. *Brit. M. J.* 607-608, Oct. 19, 1947.
2. BRIGGS, W. T.: Etiology and therapy of non-tuberculous kidney infections. *Urol. & Cutan. Rev.* 39: 149-155, March 1935.
3. COOK, E. N.: Infections of urinary tract without demonstrable organisms. *Proc. Staff. Meet., Mayo Clin.* 19: 377-380, July 26, 1944.
4. COOK, E. N.: Infections of urinary tract of obscure etiology. *J. Urol.* 36: 400-405, Oct. 1936.
5. HAMM, F. C.: Amicrobial pyuria. *J. Urol.* 57: 226-232, Feb. 1947.
6. HOLTAPPEL, H. C. E.: Sterile pyuria. *Urol. & Cutan. Rev.* 43: 477-479, 1939.
7. LANDES, R. R. and RANSOM, C. L.: Abacterial pyuria; possible relationship to Reiter's syndrome. *J. Urol.* 62: 262-277, Oct. 1948.

8. LYDON, F. L.: Reiter's syndrome and abacterial pyuria. *Brit. M. J.* 974-975 Dec. 13, 1947.
9. MCGINN, E. J.: True infective abacterial pyuria. *Wisconsin M. J.* 45: 845-847, Sept. 1946.
10. MOORE, T. (Manchester): True infective abacterial pyuria. *Brit. J. Urol.* 17: 131-135, Dec. 1945.
11. MOORE, T.: Abacterial pyuria. *Brit. M. J.* 1: 170-176, 1940.
12. PETERS, W.: Aseptic renal pyuria. *Abstr. J. A. M. A.* 24: 1750-1752, 1920.
13. SCHAUFFHAUSER, F.: Die Sogennanten abakteriellen renalen pyurien. *Ztschr. f. Urol. Chir. u. Gynak.* 43: 83-140, 1937.
14. SOLOMON, A. A.: Effect of arsenotherapy on upper urinary tract changes in infectious abacterial pyuria. *J. Urol.* 59: 252-257, Feb. 1948.
15. WALLMAN, D. R.: Report of case of true infective abacterial pyuria. *M. J. Australia* 2: 93-94, July 20, 1946.





# Exfoliative Dermatitis Following the Administration of Penicillin

EDWARD LANGDON *Captain, MC, A U S.*<sup>1</sup>

THE increasing use of penicillin in the past 5 years has been accompanied by numerous reports of adverse reactions. One of the less frequently described types of reaction has been generalized exfoliative dermatitis.

Nolan and Pedigo (1) found no report in the literature prior to April 1946, of exfoliative dermatitis following the administration of penicillin, and reported the case of a 60-year-old man who developed urticaria and generalized erythema after 75,000 units of his first course of penicillin. Two weeks later penicillin therapy was re-instituted. After 80,000 units the erythema recurred and progressed to a generalized exfoliative dermatitis. After recovery a patch test was positive for the brand of penicillin used, but was negative with another brand. Goldman et al. (2), while reporting various dermatoses from penicillin, mentioned the exfoliative type in a 50-year-old man. The dermatitis appeared after 1.9 units of penicillin had been given intramuscularly and 80,000 units had been given intrathecally. A positive skin reaction to penicillin was demonstrated after recovery. Eilert (3) reported a case of exfoliative dermatitis with spontaneous recovery and a positive intradermal test in a 56-year-old man receiving an aqueous solution of penicillin intramuscularly.

Farrington and Tamura (4) reported the case of a 78-year-old man who received an aqueous solution of penicillin intramuscularly. On the fourth day of treatment he developed generalized erythematous maculopapular eruption. After three additional days of penicillin therapy vesicular and bullous lesions appeared over the thighs, buttocks, and abdomen, and the erythema became confluent. Therapy was discontinued, but exfoliation of the skin persisted with loss of the nails and slight alopecia. Positive skin reactions to penicillin were observed after recovery. Shaffer (5) reported a 27-year-old man who developed exfoliative dermatitis after having received peni-

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## CASE REPORTS

*Case 1.*—A 23-year-old man was admitted on 18 October 1948. He had received daily intramuscular injections of penicillin in oil and beeswax and aqueous penicillin locally for trench mouth from 24 to 28 September. One week after therapy had been discontinued he noticed a pale erythematous pruritic eruption in the intercrural folds. For the following week he was treated with Benadryl locally without relief. The erythematous eruption became generalized and was followed by exfoliation. The process involved the scalp and face, but not the palms and soles. His only complaints were pruritis and sensations of chilliness. Physical examination revealed generalized exfoliation of fine white scales from a slightly erythematous base and a mild nontender generalized lymphadenopathy. The leukocyte count was 7,000 with 55 percent neutrophils, 40 percent lymphocytes, 3 percent monocytes, 1 percent eosinophils, and 1 percent basophils. The patient remained in the hospital for 1 week. Therapy consisted of constant dusting with purified talc. At the time of discharge he had a slight residual exfoliation but was asymptomatic.

*Case 2.*—A 53-year-old man was admitted on 23 December 1948. He gave a history of having received daily intramuscular injections of penicillin in an absorption-delaying vehicle on 24 and 25 November for a furuncle on the neck. Four days later he noticed an itching erythematous rash in the groin and urticaria over the abdomen. In the following week the erythema became generalized and the epidermis began to exfoliate in large flakes. This process continued for 2 weeks, during which time his only symptom was severe pruritus. Three days before admission he became anuric, slightly dyspneic, nauseated, and vomited several times daily. Past history revealed that albuminuria had been noted in 1944, and that he had been retired from the Armed Forces in 1946 with a diagnosis of nephritis. His complaints prior to those of the present illness were minimal ankle edema after prolonged standing and nocturia one or two times nightly.

Physical examination revealed a severe papulopustular exfoliative dermatitis involving the entire face, trunk and limbs. The skin was heavily erythematous and slightly edematous. There were multiple small vesicles located about the periphery. The surfaces of the nose and tongue. The conjunctivae were covered small amounts of yellow exudate. The vitreous bodies were moderately involved with slight interstitial changes. There was a large patch of eczematous dermatitis on the right arm (Fig. 1). The blood pressure was 140/90 mm. Hg. Hemoglobin 20 gm. per 100 cc. blood. Creatinine 2.0 mg. per 100 cc. blood and 0.4 mg./ml. serum 25 volumes per cent. packed. The hematocrit was 33.4 ml.; erythrocytes count 3,500,000 and polymorphs count 21 per cent. 75 percent neutrophils, 15 percent lymphocytes, 4 percent monocytes and 2 percent eosinophils. The specific gravity of the urine was 1.025. The urinary sediment was 30 mg. per 100 ml.

Local therapy with penicillin was started but soon was discontinued because of application when becoming more extensive. He was given a 2,000,000 units dose containing 40 mg. of penicillin. The fluid intake was maintained at about 3 liters daily. On the second hospital day he began to excrete urine, but the volume remained small. His general condition remained stable until the third hospital day when there was a recurrence of nausea and vomiting. He became drowsy. Additional therapy included intravenous infusions of NaCl solution, insulin, a blood transfusion, calcium chloride, and codeine for extreme intractability. He was slowly improved on 4 January 1945 but on the 10th he again became worse. He began to lose weight and he became anorectic and emaciated and died 21 months later. During the hospital course the nitrogen balance decreased progressively to 1.6 mg. per 100 cc. blood on the day preceding death. The creatinine varied from 11.5 to 14.5 mg. per 100 cc. blood. The 0.4 mg./ml. serum varied between 14 and 22 volumes per cent. packed. On 4 January the calcium was 6.7 mg. per 100 cc. blood. The specific gravity of the urine never exceeded 1.00. The urinary sediment varied from 4 to 100 mg. per 100 cc. The hemoglobin and erythrocyte counts gradually declined to 3.5 gm. per 100 cc. and 3,500,000, respectively. The electrocardiogram showed some moderate left axis deviation, and a prolonged Q-T interval. Roentgenographic study revealed small contracted kidneys bilaterally.

In addition to severe exfoliative dermatitis, post-mortem examination revealed the changes of chronic glomerulonephritis with kidneys weighing 65 and 74 gm. The cortices were 0.3 cm. in diameter and the boundaries between cortex and medulla were difficult to distinguish. The glomeruli presented degeneration from increased cellularity and decreased vascularity by fibrous tissue and hyalinization. The process in some glomeruli thought to be of recent origin. The liver weighed 2140 gm. of the normal size and texture with central fatty change. The ventricular walls were not obviously hypertrophied. Enlargement of the papillary muscles of the left ventricle changing condition of the mitral valve. There was no congestion of the lungs, liver, spleen, and kidneys. The bladder was distended. Death was caused by chronic exfoliative dermatitis.

#### DISCUSSION

It is surprising that so few cases of exfoliative dermatitis following the administration of penicillin have been reported. Apparently, there

or in combination, predispose to dermatitis; these are penicillin, its impurities, the vehicle, and extrinsic sources of fungi. Sensitization may follow contact, ingestion, inhalation, or injection of these agents. All of the cases reported have been in men; their ages ranging from 23 to 78 years. In both of the patients who died, renal and hepatic damage was found at autopsy. In one there was a history and evidence of preexisting chronic glomerulonephritis, but in addition, there were acute lesions in some of the glomeruli. Because of the possibility of severe exfoliative dermatitis, penicillin should be used only in the presence of definite indications.

## REFERENCES

1. NOLAN, D. E., and PEDIGO, G. W., JR.: Exfoliative dermatitis following penicillin therapy. *Ann. Int. Med.* 25: 725-728, Oct. 1946
2. GOLDMAN, L.; FRIEND, F.; and MASON, L. M.: Dermatitis from penicillin *J. A. M. A.* 131: 883-890, July 13, 1946.
3. EILEET, M. L.: Symposium on advances in clinical medicine; adverse reactions to sulfonamides and antibiotics. *M. Clin. North America* 31: 31-42, Jan. 1947.
4. FARRINGTON, J., and TAMURA, J.: Cutaneous testing in case of exfoliative dermatitis caused by penicillin *Arch. Dermat & Syph* 56: 807-811, Dec. 1947.
5. SHAFFER, J. O.: Generalized exfoliative dermatitis due to penicillin. *New England J. Med.* 238: 660-661, May 6, 1948.
6. BARNSDALE L. E.; FROST, D. M.; and NOLAN, J. J.: Reactions from penicillin. *U. S. Nav. M. Bull.* 48: 883-886, Nov.-Dec. 1948.



Physical examination revealed a severe generalized exfoliative dermatitis involving the scalp, face, palms, and soles. The skin was deeply erythematous and slightly edematous. There were multiple small weeping fissures about the forearms. The furuncle of the neck had healed. The conjunctival sacs contained small amounts of yellow exudate. The retinal arterioles were moderately narrowed with slight arteriovenous nicking. There was a large patch of exudate lateral to the right optic disk. The blood pressure was 180/85, nonprotein nitrogen, 320 mg. per 100 cc blood, creatinine, 115 mg per 100 cc blood, and  $\text{CO}_2$  combining power, 29 volumes per 100 cc blood. The hemoglobin was 11.4 gm; erythrocyte count, 3,920,000, and leukocyte count, 19,000 with 72 percent neutrophils, 15 percent lymphocytes, 8 percent monocytes, and 5 percent eosinophils. The specific gravity of the urine was 1.008. The urinary albumin was 168 mg per 100 cc.

Local therapy with powdered corn starch was begun, but was later changed to olive oil application when fissuring became more extensive. He was given a 2,000 calorie diet containing 40 gm of protein. The fluid intake was maintained at about 3 liters daily. On the second hospital day he began to excrete urine, but the volume remained small. His general condition remained stable until the tenth hospital day when there was a recurrence of nausea and vomiting. He became drowsy. Additional therapy included intravenous infusions of M/6 sodium lactate, a blood transfusion, calcium gluconate, and crude liver extract intramuscularly. He was slightly improved on 6 January 1949, but on the following morning, while being helped out of bed, he became unconscious and cyanotic and died 20 minutes later. During the hospital course the nonprotein nitrogen decreased irregularly to 186 mg per 100 cc blood on the day preceding death. The creatinine varied from 11.2 to 14.8 mg per 100 cc blood. The  $\text{CO}_2$  combining power varied between 14 and 33 volumes per 100 cc blood. On 4 January the calcium was 6.7 mg. per 100 cc blood. The specific gravity of the urine never exceeded 1.009. The urinary albumin varied from 0 to 168 mg per 100 cc. The hemoglobin and erythrocyte counts gradually declined to 9.4 gm per 100 cc and 3,050,000, respectively. The electrocardiogram showed sinus tachycardia, left axis deviation, and a prolonged Q-T interval. Retrograde pyelography revealed small contracted kidneys bilaterally.

In addition to severe exfoliative dermatitis, post-mortem examination revealed the changes of chronic glomerulonephritis with kidneys weighing 65 and 74 gm. The cortices were 0.3 cm in diameter and the boundaries between cortex and medulla were difficult to distinguish. The glomeruli presented various stages of degeneration from increased cellularity and decreased vascularity to replacement by fibrous tissue and hyalinization. The process in some of the glomeruli was thought to be of recent origin. The liver weighed 2.140 gm and showed destruction of the normal architecture with central fatty change. The heart weighed 400 gm. The ventricular walls were not obviously hypertrophied, but there was some enlargement of the papillary muscles of the left ventricle and thickening of the chordae tendinae of the mitral valve. There was moderate chronic passive congestion of the lungs, liver, spleen, and kidneys. The mucous membrane of the bladder was denuded. Death was caused by chronic glomerulonephritis and exfoliative dermatitis.

#### DISCUSSION

It is surprising that so few cases of exfoliative dermatitis following the administration of penicillin have been reported since many more must have occurred. Apparently, there are several factors that, alone

or in combination, predispose to dermatitis; these are penicillin, its impurities, the vehicle, and extrinsic sources of fungi. Sensitization may follow contact, ingestion, inhalation, or injection of these agents. All of the cases reported have been in men; their ages ranging from 23 to 78 years. In both of the patients who died, renal and hepatic damage was found at autopsy. In one there was a history and evidence of preexisting chronic glomerulonephritis, but in addition, there were acute lesions in some of the glomeruli. Because of the possibility of severe exfoliative dermatitis, penicillin should be used only in the presence of definite indications.

#### REFERENCES

1. NOLAN, D. E., and PEDIGO, G. W., JR.: Exfoliative dermatitis following penicillin therapy. *Ann. Int. Med.* 25: 725-728, Oct 1946
2. GOLDMAN, L.; FRIEND, F.; and MASON, L. M.: Dermatitis from penicillin *J. A. M. A.* 131: 883-890, July 13, 1946.
3. EILERT, M. L.: Symposium on advances in clinical medicine, adverse reactions to sulfonamides and antibiotics *M Clin North America* 31: 31-42, Jan. 1947.
4. FARRINGTON, J., and TAMURA, J.: Cutaneous testing in case of exfoliative dermatitis caused by penicillin. *Arch. Dermat & Syph.* 56: 807-811, Dec 1947.
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Examination after transfer showed that the patient was only able to stand long enough to get from his bed to a wheel chair. There was atrophy of the thigh and calf muscles, more noticeable on the left, with bilateral weakness of the gluteal, gastrocnemii, extensor digitorum longi, and the peroneal muscles. The right tibialis anterior muscle was fairly strong but the left was weak. The external hamstring reflexes were sluggish, and the internal hamstring reflexes and ankle jerks were absent. There were no sensory changes except a diminution of vibratory sense in the left big toe.

The patient continued to complain of low back pain and night sweats and his fever fluctuated between 99° and 101° F. On 6 August his temperature went up to 102.8° F. Chemotherapy was again administered. Blood culture was negative, but the brucellosis agglutination was positive in a titer of 1:2560. The leukocyte count was 11,800 with 71 percent neutrophils, 28 percent lymphocytes, and 1 percent monocytes. The sedimentation rate was 49. Reexamination of the patient revealed a moderately enlarged spleen. On 12 August a lumbar puncture was attempted between the third and fourth lumbar vertebrae, but no fluid was obtained even after aspiration. Another needle was then inserted between the second and third lumbar vertebrae with the return of clear spinal fluid under a pressure of 100 mm. water. A third needle was inserted between the fifth lumbar vertebra and the sacrum. The dural sac was not entered in this region, for prior to reaching the depth of the dural sac a creamy exudate was recovered through the needle. On 13 August penicillin was discontinued and streptomycin, 0.5 gm. every 4 hours for 10 days together with sulfadiazine, 1 gm. every 4 hours, was given. Examination of the spinal fluid obtained from between the second and third lumbar vertebrae on 12 August revealed 37 white blood cells, one of which was a neutrophil, positive globulin, total protein, 210 mg. per 100 cc., and a gold curve of 5533543211. Roentgenograms of the lumbar spine on 14 August were negative for evidence of bone disease.

On 16 August a laminectomy was performed. The spinous process of the fifth lumbar vertebra was removed and the dura mater exposed, but no frank pus was encountered. The spinous process of the fourth lumbar vertebra was then removed and a small amount of necrotic material was found in the area of the fifth lumbar vertebra posteriorly between the neural arch and the dura. Further exploration revealed no additional exudate. At the operative site there was some bulging of the dura but it was not opened. The cauda equina, seen through the dura, appeared normal. The patient made a good recovery.

On 2 September the laboratory reported that cultures of the blood taken on 6 August and the creamy exudate discovered between the fifth lumbar vertebra and the sacrum on 12 August both revealed *Brucella suis*, confirmed serologically. Culture of the exudate taken at the time of the laminectomy after beginning treatment with streptomycin and sulfadiazine was negative. At discharge on 24 November the patient's only complaint was a slight weakness in dorsiflexion of the left foot; he was afebrile and the spleen could not be palpated. On neurologic examination, 50 to 80 percent of normal strength was noted in the muscles supplied by the left common peroneal nerve.

#### SUMMARY

An epidural abscess in the region of the fifth lumbar vertebra occurred in a patient who worked in a meat-packing plant. The etiologic factor did not become evident until after he showed abnormal neurologic signs in the lower extremities, abnormal spinal fluid findings, an enlarged spleen, and a brucellosis agglutination titer that rose

from 1:320 to 1:2560. Roentgenograms of the lumbar vertebrae were negative. Blood culture and culture of the epidural abscess were positive for *Brucella suis*. Drainage of the epidural abscess by laminectomy and treatment with streptomycin and sulfadiazine resulted in a cure.

## REFERENCES

1. PHALEN, G. S.; PRICKMAN, L. E.; and KRUSEN, F. H.: Brucellosis spondylitis, treatment by physically induced hyperpyrexia. J. A. M. A. 118: 859, March 14, 1942.
2. STEINBERG, C. L.: Brucellosis as cause of sacroiliac arthritis. J. A. M. A. 138: 1519, Sept. 4, 1948.
3. KULOWSKI, J., and VINKE, T. A.: Undulant (Malta) fever spondylitis; report of case due to *Brucella melitensis*, bovine variety, surgically treated. J. A. M. A. 99: 1656-1659, Nov. 12, 1932.





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available in this case. The possibility of polioencephalitis should be noted; however, this case occurred in December, and the signs and symptoms were not indicative of this disease. Tuberculous meningitis was considered, but discounted after a negative tuberculin test, negative roentgenogram of the chest, spinal fluid findings which were not compatible with this type of meningitis, and recovery. Syphilitic meningitis was disproved by negative serologic studies. Netter (11) found that when herpes zoster and epidemic encephalitis occurred in the same patient, zoster followed encephalitis.

Krumholz et al. (10) interpreted the pathologic changes to suggest a toxic encephalitis due to an allergic response of the patient to the virus of herpes zoster. Our spinal fluid findings on three occasions of high cell count and high globulin suggest an extension of herpetic infection rather than a toxic or allergic manifestation.

#### SUMMARY

*Herpes zoster was followed in 1 week by manifestations of encephalitis in a 17-year-old girl. It is suggested that the etiological agent was common to both.*

#### REFERENCES

1. HASSIN, G. B. Herpetic meningoencephalitis. *J Neuropath & Exp Neurol* 3: 357-367, 1935
2. TRALHIMER, W. Herpes zoster: central nervous lesions similar to those of epidemic encephalitis. *Arch Neurol & Psychiat* 12: 73, 1924
3. BIGGART, J. H. and FISHER, J. A. Meningoencephalitis complicating herpes zoster. *Lancet* 2: 944, 1938
4. ANDERSON, M. S., and WULFF, F. Meningitis serosa und encephalitis bei zoster. *Acta psychiat et neurol* 8: 213, 1934
5. BRILAVITIS, A. Nevralgie du herpes-zoster. *Contributions clinico-anatomiques. Riv neurol* 4: 337, 1931
6. ROGER, H., POURSINFS, Y., and PAILLAS, J. Orignine zosterienne probable d'une poliomyelencephalo-myelitte subaigue. *Rev otoneuro-oftal* 16: 176, 1938
7. SCHIFF, C. I., and BRAIN, W. R. Acute meningoencephalitis associated with herpes zoster, a fatal case. *Lancet* 2: 70, 1930
8. THOMAS, A., and LUYAT, J. B. Existe-t-il une encéphalite zonotique? Herpès zoster à foyers multiples (mort au huitième jour). *Paris méd* 1: 600-604, June 27, 1931
9. CASTEL, J. Sur un nouveau cas d'atteinte du nerfave dans le zona. *Thesis Bosc freres, Lyon, 1935*
10. KRUMHOLZ, S., and LICHAN, J. Encephalitis associated with herpes zoster. *Arch Neurol & Psychiat* 53: 59-67, 1945
11. NETTER, A. Six observations de zozas dans l'encéphalite kthargique. *Bull. et mém. Soc. méd. d'hôp. de Paris* 54: 793-798, May 19, 1930.



# Systemic Effects of Oral Foci of Infection

MARTIN L. SEGAL, Major, DC, U. S. A.<sup>1</sup>  
JOSEPH J. C. THOMSON, Captain, DC, A. U. S.<sup>1</sup>

**F**OCAL infection is defined as the condition in which a primary source of infection causes disease in some other part of the body (1). This is transmitted as a bacteremia or circulating allergen, which finds its way through the blood stream or lymph channels, or may spread by direct extension. Much has been written in the last four decades about the relationship between dental foci and systemic disorders. This article reports a series of patients in whom various physical symptoms and lesions were relieved by the removal of oral foci.

## CASE REPORTS

*Case 1.*—A 28-year-old man was seen on 4 April 1949 because he could not readily adapt his vision when going from a light to a dark room. When he usually did adapt to the dark, a blind spot remained in the center of the visual field of the left eye. This condition appeared suddenly. Fundoscopic examination showed pallor in the temporal and nasal regions with blurring of the optic disk. His vision was normal under ordinary conditions, but the blind spot was unusually prominent when he tried to adapt to sunlight. The diagnoses considered were intraocular neuritis, retrobulbar neuritis, and early multiple sclerosis. The patient was referred to the dental clinic to rule out an oral focus of infection. A complete roentgenographic examination of the teeth showed a retained root tip in the upper left bicuspid region, but no noticeable area of infection surrounding it. The oral mucous membrane appeared normal; the patient had no oral subjective symptoms. Removal of the root tip resulted in a complete, uneventful recovery within 1 week. Examination 1 month later, showed no recurrence of ocular symptoms.

*Case 2.*—A 19-year-old man reported to the out-patient clinic on 10 December 1948 with fever, malaise, and a gastrointestinal upset of 4 days' duration. He was examined thoroughly, and an erythema was discovered over the upper dorsal and lower cervical areas of the back. This was diagnosed as a toxic erythema. The medical officer suspected a focus of infection. Roentgenograms of the teeth showed a partially erupted lower right third molar with a pericoronal

<sup>1</sup>General Dispensary, New York, N. Y.

available in this case. The possibility of polioencephalitis should be noted; however, this case occurred in December, and the signs and symptoms were not indicative of this disease. Tuberculous meningitis was considered, but discounted after a negative tuberculin test, negative roentgenogram of the chest, spinal fluid findings which were not compatible with this type of meningitis, and recovery. Syphilitic meningitis was disproved by negative serologic studies. Netter (11) found that when herpes zoster and epidemic encephalitis occurred in the same patient, zoster followed encephalitis.

Krumholz et al. (10) interpreted the pathologic changes to suggest a toxic encephalitis due to an allergic response of the patient to the virus of herpes zoster. Our spinal fluid findings on three occasions of high cell count and high globulin suggest an extension of herpetic infection rather than a toxic or allergic manifestation.

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9. CASTEL, J. Sur un nouveau cas d'atteinte du nerf dans le zona. Thesis. Bosc frères, Lyon, 1935.
10. KRUMHOLTZ, S., and LAMAR, J. Encephalitis associated with herpes zoster. *Arch Neurol & Psychiat* 53: 57-67, 1945.
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*Case 2.*—A 19-year-old man reported to the out-patient clinic on 10 December 1948 with fever, malaise, and a gastrointestinal upset of 4 days' duration. He was examined thoroughly, and an erythema was discovered over the upper and lower cervical areas of the back. This was diagnosed as a toxic erythema. The medical officer suspected a focus of infection. Roentgenograms of the teeth showed a partially erupted lower right third molar with a pericoronal

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abscess surrounding it. Three hundred thousand units of penicillin were administered daily until the pericoronitis subsided. The tooth was removed on 15 December and the toxic erythema disappeared completely.

*Case 3*—A 53-year-old man reported to the out-patient clinic on 23 March 1949 because of a patchy papulo-erythematous dermatitis of the sacral and upper inner left gluteal areas accompanied by pruritus. There was a lichenoid plaque about 2 inches long, which was gradually becoming larger. A biopsy on 24 March showed no evidence of malignancy. On 25 April no improvement was noted and scrapings of the area were examined, but no fungi were found. Complete dental roentgenograms showed two small, extremely opaque foreign bodies with surrounding areas of radiolucency in the lower left molar area; these were about 0.1 cm. in diameter and were lodged just below the alveolar crest. When the mucoperiosteal flap was laid back and the outer layer of bone was removed, an area of granulation surrounding both foreign bodies (pieces of amalgam filling material) was found. Following their removal all skin symptoms subsided; no recurrence was noted 1 month later.

*Case 4*—A 57-year-old man was seen in the out-patient clinic on 20 June 1949 because of two dry, hypertrophic pruritic plaques—one on the left ankle, and one on the inner aspect of the left leg. The diagnoses considered were lichen planus, hypertrophicus and fungus infection. The patient was treated with lotions and ointments for 1 week, with no apparent improvement. Fungus culture was negative. A roentgenogram of the teeth showed a retained root in the region of the upper right first bicuspid. Clinical examination of the mouth revealed a minute, fistulous tract in that area, from which purulent material could be expressed. The root tip was removed. Examination of the patient's leg 1 week later showed 75 percent healing of the two plaques. One week later the two plaques had completely disappeared.

*Case 5*—A 29-year-old man reported on 20 July 1949 because of a maculopapular vesicular rash on his nose, lips, and extensor aspects of both arms, and a few scattered lesions on both lower extremities. He had had similar intermittent attacks for 6 years. Roentgenograms of the teeth disclosed a periapical lesion of the lower left cuspid. The radiogram also showed a poorly condensed inadequate root canal filling, present since 1943. The date of the filling coincided with the onset of his skin lesions. The filling was removed, the canal widened and refilled, apicectomy accomplished, and the patient given 300,000 units of penicillin in oil. Within 10 days the skin lesions had completely disappeared.

*Case 6*—A 44-year-old man was seen in the out-patient clinic on 23 June 1949 because of loss of 15 pounds in the 2 previous months, and a bilateral low back pain of 2 weeks' duration. The patient claimed that his appetite had been poor for a few weeks and that he had a general feeling of weakness with associated attacks of vertigo. Dental roentgenograms disclosed a retained root in the region of the upper left first molar. This was removed and at that time a sinus extending from the alveolus to the left maxillary antrum was noted. A plastic closure was performed; healing was noted 2 days later. One week later, the low back pain and attacks of vertigo had completely disappeared. There had been no recurrence.

#### REFERENCE

1. MILLER, S. C.: *Textbook of Periodontia*. 2d edition. The Blakiston Co., Philadelphia, Pa., 1943. p. 625.



# About the Army Medical Department

PAUL I. ROBINSON, *Colonel, MC, U S A*<sup>1</sup>

**D**URING 1949, regular members of the Medical Department have increased about as follows: Medical Corps 323 (27 percent); Dental Corps 17 (5 percent); Veterinary Corps 2 (1 percent); Medical Service Corps 14 (2 percent); Army Nurse Corps 34 (3 percent); and Women's Medical Specialist Corps 2 (1 percent). Since 1 July 1949, 293 medical officers have been brought on active duty; 65 dental officers; 11 veterinary officers; 37 medical service officers; 242 Army nurse officers; and 51 Women's medical specialists. These figures include some who transferred to the Air Force last July. They show that the regular establishment is being gradually built to strength and that there are substantial numbers in all corps who have seen fit to affiliate themselves with the Medical Department for a tour of duty. The programs which are making this progress possible deserve brief discussion.

Information concerning the Medical Department is constantly being placed before appropriate groups through the media of press releases, radio and television programs and spots, magazine articles, specially prepared pamphlets, informational letters, specific correspondence, and personal contact. All this is done in accordance with a predetermined plan. Information so disseminated is checked meticulously for accuracy and attempts to portray an honest evaluation of the subject matter covered. There is every reason to believe that this information has been received well by those most concerned. A better understanding than has been experienced for many years now exists, not only among our own personnel, but also within the various civilian medical and allied professions.

Early in the year, the American Medical Association and the Office of the Secretary of Defense, recognizing the serious shortage of medical officers facing the Army, Navy, and Air Force, launched separate pressure campaigns directed at young doctors of medicine and dentistry who had participated in Army Specialized Training and

<sup>1</sup> The Personnel Division, Office of the Surgeon General



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*Case 3*.—A 35-year-old man reported to the out-patient clinic on 23 March 1949 because of a patchy papulo-erythematous dermatitis of the sacral and upper inner left gluteal areas, accompanied by pruritis. There was a lichenoid plaque about 2 inches long, which was gradually becoming larger. A biopsy on 24 March showed no evidence of malignancy. On 25 April no improvement was noted and scrapings of the area were examined, but no fungi were found. Complete dental roentgenograms showed two small extremely opaque foreign bodies with surrounding areas of radiolucency in the lower left molar area; these were about 0.1 cm. in diameter and were lodged just below the alveolar crest. When the mucoperiosteal flap was laid back and the outer layer of bone was removed, an area of granulation surrounding both foreign bodies (pieces of amalgam filling materials) was found. Following their removal all skin symptoms subsided; no recurrence was noted 1 month later.

*Case 4*.—A 37-year-old man was seen in the out-patient clinic on 30 June 1949 because of two dry hypertrophic pruritic plaques, one on the left ankle, and one on the inner aspect of the left leg. The diagnoses considered were lichen planus hypertrophicus and fungus infection. The patient was treated with lotions and ointments for 1 week with no apparent improvement. Fungus culture was negative. A roentgenogram of the teeth showed a retained root in the region of the upper right first bicuspid. Clinical examination of the mouth revealed a minute, fistulous tract in that area, from which purulent material could be expressed. The root tip was removed. Examination of the patient's leg 1 week later showed 75 percent healing of the two plaques. One week later the two plaques had completely disappeared.

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*Case 6*.—A 44-year-old man was seen in the out patient clinic on 23 June 1949 because of loss of 15 pounds in the 2 previous months, and a bilateral low back pain of 2 weeks duration. The patient claimed that his appetite had been poor for a few weeks and that he had a general feeling of weakness with associated attacks of vertigo. Dental roentgenograms disclosed a retained root in the region of the upper left first molar. This was removed and at that time a sinus extending from the alveolus to the left maxillary antrum was noted. A plastic closure was performed; healing was noted 2 days later. One week later the low back pain and attacks of vertigo had completely disappeared. There had been no recurrence.

#### REFERENCE

1. MILLER, S. C.: *Textbook of Periodontia*, 2d edition. The Blakiston Co., Philadelphia, Pa., 1943, p. 625.



# About the Army Medical Department

PAUL I. ROBINSON, *Colonel, MC, U. S. A.*<sup>1</sup>

**D**URING 1949, regular members of the Medical Department have increased about as follows: Medical Corps 323 (27 percent); Dental Corps 17 (5 percent); Veterinary Corps 2 (1 percent); Medical Service Corps 14 (2 percent); Army Nurse Corps 34 (3 percent); and Women's Medical Specialist Corps 2 (1 percent). Since 1 July 1949, 293 medical officers have been brought on active duty; 65 dental officers; 11 veterinary officers; 37 medical service officers; 242 Army nurse officers; and 51 Women's medical specialists. These figures include some who transferred to the Air Force last July. They show that the regular establishment is being gradually built to strength and that there are substantial numbers in all corps who have seen fit to affiliate themselves with the Medical Department for a tour of duty. The programs which are making this progress possible deserve brief discussion.

Information concerning the Medical Department is constantly being placed before appropriate groups through the media of press releases, radio and television programs and spots, magazine articles, specially prepared pamphlets, informational letters, specific correspondence, and personal contact. All this is done in accordance with a predetermined plan. Information so disseminated is checked meticulously for accuracy and attempts to portray an honest evaluation of the subject matter covered. There is every reason to believe that this information has been received well by those most concerned. A better understanding than has been experienced for many years now exists, not only among our own personnel, but also within the various civilian medical and allied professions.

Early in the year, the American Medical Association and the Office of the Secretary of Defense, recognizing the serious shortage of medical officers facing the Army, Navy, and Air Force, launched separate pressure campaigns directed at young doctors of medicine and dentistry who had participated in Army Specialized Training and

<sup>1</sup> The Personnel Division, Office of the Surgeon General.

# Health Discipline

*Lieutenant General SIR NEIL CANTLIE<sup>1</sup> ABE, CB, FRCS, AHP*

FIELD MARSHAL MONTGOMERY, in 1945, paid a remarkable tribute to the Royal Army Medical Corps when he wrote "to the Royal Army Medical Corps whose contribution to victory has been beyond all calculation." These are impressive words addressed by one of our greatest generals to the Army Medical Services which comprise the Royal Army Medical Corps, the Royal Army Dental Corps, and Queen Alexandra's Royal Army Nursing Corps. Never before have such glowing words been addressed by a British commander to army physicians, dentists, and nurses.

Field Marshal Montgomery stressed five main points in the contribution that the Army Medical Services had made: (a) Forward surgery by the field surgical units; (b) blood transfusions and its availability in the forward units; (c) skilled nursing by Army nurses in forward areas; (d) penicillin and sulfonamides; and (e) air evacuation. These are all factors that have made the difference between life and death to the wounded man and they are all concerned with curative medicine. As a further contribution to victory, a sixth point can be added which is concerned with preventive medicine. It is called health discipline and defined as measures that concern the preservation of health and the prevention of disease which are enforced by disciplinary means. These six points contributed to victory because they conserved manpower, and the recovery of sick and wounded men in total war is of great importance to total manpower. Since manpower is ultimately a deciding factor in war, an efficient medical service has an important part to play.

The effective, and, at times, overwhelming part the medical services can play in war has been gradually recognized by military commanders in the field, and this has been especially emphasized where the campaigns have been fought in countries with low standards of health. None more so than in the recent campaigns in Burma and the Pacific. The campaign in Burma in 1942 showed the extent to which military operations could be dominated by malaria. In 1943 in Burma the

<sup>1</sup> Director General, British Army Medical Services.

morbidity rate caused by malaria was as high as 450 cases per 1,000 per month in certain forward units in contact with the enemy, where active service conditions seriously interfered with antimalarial measures. This may seem enormous at first, but remember that it is only 15 men out of a battalion of 1,000 strong, reporting each day with malaria. Although such high rates were exceptional, rates of 200 to 250 per 1,000 per month were common among forward troops. The commanders of formations saw their forces melting away and could do nothing to prevent it.

The accepted attitude was to lay the responsibility for health on the physicians' shoulders. The prevention of malaria was a physician's duty, almost a physician's fad to which the fighting soldier paid little attention. His job was to fight and defeat the enemy. It was not appreciated that unless the battle against disease was fought and won first, there would be no troops to defeat the enemy. The battalion or regimental medical officer did his best to persuade the troops to use mosquito nets when this was possible, and to smear on repellents when they were on patrol or sentry duty. The unit sanitary personnel used Paris green and oil on pools where mosquitoes bred, and drained away stagnant water. But essentially it was a medical matter and no concern of the fighting soldier whose mind was taken up with tactical plans to defeat the enemy. It is true that the unit commander was, by regulations, responsible for the health of his troops, but he relied on his medical officer to put any measures into effect, and these were limited to what the commander thought could be adopted under the existing conditions of active service.

The campaigns in Burma and New Guinea quickly showed that combat was impossible when medical recommendations were overruled. Then came the experiments of Fairley in Australia. He proved that when one tablet of atabrine was taken daily it was impossible to get malaria. He would never report sick with malaria, no matter how many times the man was bitten by infected mosquitoes, how much he suffered exposure and fatigue, or how cold or hungry he became. When Fairley reported the success of his experiments to the American and Australian commanders in the Pacific they were quick to grasp its importance.

One commander said: "You doctors think you can prevent malaria, but you can't. I can and I'm going to." By these words, "I am going to prevent malaria," the war in the Far East was revolutionized and victory was made possible. Prevention of malaria was taken out the physician's hands and accepted by the staff. Commanders at once became responsible to assure that their soldiers did not acquire malaria, by seeing that the taking of atabrine was made a disciplinary matter. This was accomplished by requiring a daily



The conception of the mingling of military tactics and medical science leads me to say a word about bacteriologic warfare. The bacteriologist is intimately concerned here with the actual means of destruction. We see him in the laboratory growing cultures with a view to spreading disease and death. Is this one of the prospects of advancing civilization? We as physicians have previously known no medical secrets between nations; medicine was international. There was no iron curtain until the future menace of bacteriologic warfare cast its shadow over us. Let us pray that as physicians we will never be asked to cause disease in or destroy our fellow beings. Our mission in life is to stamp out disease not to cause it, to prolong life not to shorten it.

The army medical services in war rise to a peak of importance that is sustained by the constant prospect of violent death in all its forms. The army physician becomes a savior of life and a healer of pain, while the efficiency of the medical services may be the personal concern of every soldier in the field. In the last war, as the tribute from Field Marshal Montgomery shows, our reputation has never stood so high. Our advice was accepted and enforced by commanders who wielded vast authority. It has always been the invariable experience that the lessons learned in the violence and tumult of war tend to become forgotten in the days of peace. The voice of the physician becomes a still, small voice and a generation soon grows up which lacks the personal experience of the imminence of sudden mutilation or death.

It must be one of our great tasks in peace to keep alive this flame of health discipline, which was first kindled in the embers of war. We must not allow that great contribution to victory in the field to be cast aside and forgotten. Human nature, being forgetful of the past, will have to be constantly reminded of the part we have to play. Our soldiers in peace do not die of malaria, or scrub typhus, or dysentery—diseases which may decimate armies in the field. We can only accomplish this task by constantly emphasizing the lessons of the past to the present and future generations. We must keep our officers aware of the problems of health discipline and we must do this by lectures and by health education, which should be part of the syllabus of all combatant officers' training. I hope this policy will bring home to our staff officers who are responsible for future planning, that the medical services must be called in at an early stage and not forgotten, which has happened in the past. Our medical intelligence must be fully developed and the importance of this branch of military medicine should be reemphasized. We must employ it with caution to avoid divulging secret information. For example, when in 1912 the invasion of

message from commanders of regiments, brigades, and divisions to the effect that every man had taken his atabrine. It was as simple as that, but it took a little time before the significance of the change of policy was realized. The morbidity rates for malaria dropped spectacularly. In India, which was a nonoperational area, in 2 years the malaria rate dropped from 248 to 34 per 1,000 per year. In West Africa the rate dropped from 900 in 1941 to 90 per 1,000 per year in 1945.

Commanding officers of units were responsible if the morbidity rate for malaria exceeded a maximum figure and one commander was relieved from duty for this reason. For the first time in history a unit commander was considered incompetent to command because he had allowed his men to become ineffective because of disease. Antimalarial precautions such as the taking of atabrine, the use of DDT, and the provision of mosquito nets and veils, became measures as important or more important than the supply of ammunition; and it became common practice in assault landings to land antimalarial supplies at least as soon as the ammunition, because ammunition was useless unless soldiers were there to use it, and a few hours of relaxed precaution, such as the failure of the supply of atabrine for 24 hours, would prove more dangerous than the failure to receive shells for the guns. As a result of the hard lessons of war this new doctrine, the active responsibility for the control of certain diseases rested with the general staff and no longer with the medical service evolved. This is the doctrine of health discipline.

This doctrine, and its corollary the control of disease opens up new tactical aspects of warfare. For example, if in a campaign one army has complete immunity from a particular disease because of its strict measures of health discipline, it could aim at forcing an enemy whose health measures were ineffective to fight in the most highly infected areas so that disease as well as bullets would lead to the defeat of the enemy. This occurred in Burma in 1945 when British and Indian troops were protected and the health discipline was of a high standard, while the Japanese army was decimated by malaria. We can, therefore, foresee that medical science may exercise an influence over the tactical aspects of a campaign in a country where endemic disease exists and where medical knowledge of one of the combatant forces has evolved a technique which is either unknown to or imperfectly used by the other. It follows that medical intelligence is of importance and may prove to be of great value in war. Medical intelligence means obtaining information of the diseases existing in other countries and the degree of medical knowledge that such countries possess.

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A variation of this problem lies in the expectation of each senior resident that he will continue with the same volume and caliber of cases that he has been handling as a senior resident. *This assumption also is fallacious.* Let us first consider the philosophy of residency training. It is not anticipated that a resident necessarily will perform every procedure known to his field during training, but that he will obtain sufficient experience and a sufficiently broad background so that he can intelligently manage whatever problems may arise later. It is not anticipated that a resident will operate at maximum capacity from the moment of completion of residency training. Let us compare these matters with the usual sequence in civil life. How many civilian residents have stepped from training into a professorship of surgery or even position as a chief of staff in a smaller hospital? How then can it be expected that the assignment situation in the service would be different? How many civilian residents have performed splenectomies, gastrectomies, combined abdomino-perineal excisions, and pneumonectomies in their first few years of private or university practice after completion of training? How then can it be expected that such a volume of cases will be available to the service physician just out of training? If we have so much trouble getting sufficient cases for the senior resident, how can he but realize that he will do less in his first years of assignment? Proper perspective is difficult to attain, but we must strive to see ourselves in proper relation to the total situation and without undue magnification of our own image or an unrealistic feeling that we will greatly outstrip our contemporaries in knowledge or skill. Unfortunately, most of us are distressingly similar in capabilities.

It seems obvious, therefore, that most men will receive station hospital assignments on completion of training and that on completion of the required practice time they will become certified specialists. Again, perspective is lost and the board certificate is assumed to be the culmination of a career when as a matter of fact it is simply a key that may unlock the door to greater opportunity. Let us hold no brief for board certification. All it means is that a man has passed through certain prescribed training in an approved institution and has made a suitable impression on a group of examiners who see the candidate under abnormal conditions and for a very short time. The certificate, then, is simply a clearance as it were, indicating that the man is ready for better things. No certificate bestows experience, judgment, or mental maturity, which are so profoundly important in service chiefs. It must be obvious then, that the newly certified specialist will become chief of a service when and if he proves himself worthy of such an assignment and when there is a vacancy in such a position. Such an assignment, then, will depend entirely on worth

and ability instead of seniority and incumbency, which is as it should be. In other words, resting on the laurels should be reserved for the period of retirement—the best possible care for the patient must always be the paramount consideration. What of the surgeon who fails of certification? Obviously, he cannot hope to become chief of a service in a teaching hospital but may become chief in a nonteaching hospital or may become post surgeon and chief of surgery in a smaller hospital. Here again, such an officer will remain in the practice of surgery or its specialties only as long as he is the best qualified officer available for the position.

As residency training decreases with the production of trained men, duty assignments will become available in general hospitals again and the best qualified men will have an opportunity to work up to assignment as chief through demonstrated ability. A pertinent word of self-caution is "Let's not get too good too soon."

#### GENERAL OUTLOOK

Having struggled to become a specialist, what is there in prospect? Data seem to indicate that the average medical officer, assuming a 30-year career, may expect to spend 10 years in assignments not requiring specialized training. He will spend another 4 years in assignments requiring only limited specialized skill, such as ward officer in a general hospital or a resident in training. He may then expect to spend about 12 years in assignments requiring advanced specialized training. About half of this time would be spent in assignments requiring board certification. The average medical officer might expect to spend 4 of his 30 years in a command or staff position. It must be emphasized that these figures pertain only to the average medical officer and within this average there will be doctors who either because they do not desire or cannot qualify, will never receive specialized training and will spend their entire career as general practitioners, while a few may perform major operations for 30 years. How does this compare with civilian practice? Much overemphasis has been placed on the fact that medical officers may be required to perform duties not directly related to patient-care without realizing that large numbers of civilian physicians are engaged in other than professional work. Figures supplied by the Resources Analysis Division, Office of the Surgeon General, show that as of 1 August 1947 4,400 physicians in the United States or 2 percent of the total, were employed by insurance companies, industrial firms, or in other administrative positions. Another 2,654 or 1 percent are superintendents of hospitals. Of the total of 197,605 physicians in the United States, only 74 percent are in private practice and of these only 22 percent are limiting their practice to a specialty. How then can it be said that administration is peculiar

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Severely wounded men unquestionably have some degree of shock although no symptoms of shock may be apparent. (It must be recalled that symptoms such as pallor, sweating, nausea, restlessness, or delirium are manifestations of late severe shock.)

The severely wounded, because of shock, are not prone to complain of pain but instead are restless and apprehensive and show excitement—the symptoms of circulatory insufficiency and cerebral hypoxia. Further, repeated doses of morphine given to patients in shock subcutaneously or intramuscularly remain in the tissues and are not absorbed until peripheral circulatory efficiency is restored. Then the accumulated doses of morphine are simultaneously absorbed and morphine poisoning occurs.

Zweifach and Hershey have shown that one of the major determinants of the character of shock is the type of anesthetic agent employed. In dogs in shock the intravenous injection of morphine produced a gradual slowing of the capillary flow and a slow depression of blood pressure which could be alleviated only with blood transfusions.

Although morphine is unquestionably of value in severe pain, no more than 10 to 15 mg. should be given. The optimum effect is obtained with 10 mg.; little more relief is obtained with doses greater than 10 or 15 mg. It must be given intravenously if immediate action is desired.

The restlessness, excitement, and apprehension of the severely wounded in shock is due to cerebral hypoxia and only blood transfusions will relieve this. Barbiturates or paraldehyde and not morphine should be used to relieve excitement and apprehension in the severely wounded.

It is well known that hypnosis or suggestion can alter the perception to pain and that the effects of an analgesic drug can be modified by psychological factors. Reassurance of the severely wounded patient, the physician's or attendant's attitude being one of conviction and that he knows what he is about, plus the use of a placebo when required will modify the patient's reaction to pain and allay his fears. Such measures in conjunction with the use of supportive measures will be effective in the treatment of pain and shock.

#### BIBLIOGRAPHY

1. BECHTOLD, H. K.: Pain in men wounded in battle. *Ann. Surg.* 123: 96-105, Jan. 1916
2. ZWEIFACH, B. W., and HERSHEY, S. G.: Predisposing action of anesthetic agents on vascular responses in hemorrhagic shock. *Surg. Gynec. & Obst.* 88: 409, Oct. 1919.

A close parallelism existed in the number wanting pain relief and those reporting bad pain:

Bad pain reported:

Yes.....	51 cases, or 23.7%
No.....	164 cases, or 76.3%

Pain relief therapy wanted.

Yes.....	58 cases, or 27.0%
No.....	157 cases, or 73.0%

The following percentages of patients in the first group said that they had bad pain:

Penetrating cerebral wounds.....	7%
Penetrating wounds of the thorax.....	12%
Extensive soft-tissue injury.....	16%
Compound fractures of long bone.....	24%
Penetrating abdominal wounds.....	45%

Of the 51 patients who reported severe pain, 5 had had no morphine and the other 46 has an average of 24.5 mg. for the most recent dose.

None of the 215 men had evidence of shock at the time of questioning. Only 25 percent said their pain was severe enough to require pain relief. The remaining 75 percent did not need pain relief despite the fact that the time since the last dose varied from 4.8 hours in penetrating abdominal wounds to 7.2 hours in extensive soft tissue wounds.

The data presented strongly suggest that morphine is all too often used indiscriminately in the belief that severe wounds are inevitably associated with intense pain and further, it appears that morphine is probably often used for the relief of symptoms other than pain.

The prevailing use of morphine in shock is also based upon an erroneous concept. Morphine is contra-indicated in shock. In shock (traumatic or hemorrhagic), arterial vasoconstriction, low circulating blood volume, poor cardiac output, slow capillary blood flow, reduced peripheral circulation, and depression of blood pressure occurs. Morphine, even in moderate doses, in shock, further depresses blood pressure and so lowers an already low circulating blood volume, and further diminishes cardiac output; it antagonizes vasoconstriction (a compensating process in shock), and dilates cutaneous vessels, and acts to further slow the blood flow and increase capillary stagnation. Morphine depresses the medullary center and stimulates the reflexes and the spinal functions. Morphine very often produces nausea, vomiting, and fainting, particularly in those with surgical lesions; it slows the pulse by vagus stimulation; it diminishes oxygen consumption and carbon dioxide output, and lessens the response to CO<sub>2</sub> and to asphyxia—all these actions aggravate existing shock.

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2. ZWEIFACH, B. W., and HERSHEY, S. G.: Predisposing action of anesthetic agents on vascular responses in hemorrhagic shock. *Surg. Gynec. & Obst.* 88: 469, Oct. 1949.



on the basis of the broad aspect of clinical practice rather than from the more narrow viewpoint of a highly specialized branch of internal medicine

Great strides have been made in this field of medicine in the past few decades. Therefore, it is essential that a carefully compiled bibliography such as is presented in this textbook be available for the student of hematology or for the practitioner—*Lieutenant Commander K P Knudtson (MC) U S N*

**HISTOPATHOLOGY OF IRRADIATION FROM EXTERNAL AND INTERNAL SOURCES** Edited by William Bloom, M D, *Professor of Anatomy, Department of Anatomy and Institute of Radiobiology and Biophysics, University of Chicago*. 808 pages illustrated. McGraw Hill Book Co., Inc., New York, N Y., publishers, 1948. Price \$8

In reality the best review of this book is that by the editor, himself, in which he gives a very impartial and honest appraisal of the type of work that was done, the aims, and the accomplishments. To elaborate somewhat more, this book is an original recording of extensive studies done in a field of great interest today. It will be an invaluable aid to workers in the field of radiobiology in general. The book's greatest value is the excellent bibliography of the existing literature up to 1945. The extensive amount of work that was done by the Chicago group and presented in this book will act as the "jumping-off" spot for future work in various other institutions and laboratories. The illustrations are plentiful and well chosen and, in general, are well reproduced by the publisher. The section on blood and blood forming organs is particularly well illustrated by excellent color drawings. These illustrations describe adequately the morphologic changes that take place in the hematopoietic organs. The experimental work is clearly outlined and the results are tabulated in such a way that it is easy to refer to them and understand the data—*Lieutenant Commander E P Cronkite (MC) U S N*

**PHYSICAL MEDICINE IN GENERAL PRACTICE**, by William Berman, M D, *Attending Physical Therapist, Mount Sinai Hospital, Assistant Clinical Professor of Medicine, Columbia University*. With a chapter on Medical Rehabilitation by Dr Sidney Licht. 2d edition, revised and enlarged. 686 pages, 310 illustrations. Paul B Hoeber, Inc., New York, N Y., publishers, 1947. Price \$8

This is an especially useful book for the physician not too familiar with the physical medicine. Each recent used in physical medicine logical rationale for each type physical medicine are covered in clear and concise language. Much of the basic principles and descriptive physics are omitted.

The subject of medical rehabilitation is well covered in a chapter by Sidney Licht. The care of paraplegic and amputee patients is adequately explained. There is also an excellent chapter on occupational therapy.

The final nine chapters of the book deal specifically with physical medicine as applied to diseases of the locomotor, nervous, cardiovascular, digestive, genito-urinary, and respiratory systems, and of the ear, nose, throat and skin.

—*Lt G E Vaupel (MC) U S N.*

**OCCUPATIONAL MEDICINE AND INDUSTRIAL HYGIENE**, by Rutherford T Johnston, A B, M D, *Consultant in Industrial Health, Lecturer at the University of California, Los Angeles, formerly Assistant Professor of Medicine, University of Pittsburgh School of Medicine, formerly Director of Department of Occupational Diseases, Golden State Hospital*. 604 pages, with 117 illustrations, 7 in color. The C V Mosby Co., St Louis, Mo., publishers, 1948. Price \$10

This new work on industrial medicine is designed to combine the clinical aspects of the occupational diseases with a description of the industrial processes, their appraisal and control. Its material is unusually well selected for use by the average naval medical officer confronted with industrial hazards and occupational diseases.

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The bulk of the book discusses, in turn, the numerous specific disease-producing substances, in sections on gaseous and vaporous agents, the metals, and the dusts, followed by a discussion of special disease and industrial problems of unusual prevalence or importance, the dermatoses, synthetic plastics, special processes new to many medical officers, and the principles of industrial hygiene and protective devices including appraisal of hazards.

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**MALIGNANT DISEASE AND ITS TREATMENT BY RADIUM**, by Sir Stanford Cade, K. B. E., C. B., F. R. C. S., M. R. C. P., Surgeon, Westminster Hospital, Mount Vernon Hospital and Radium Institute; Lecturer in Surgery, Westminster Hospital Medical School and formerly Examiner in Surgery, University of London. Member of the Court of Examiners, late Hunterian Professor and Arris and Gale Lecturer, Royal College of Surgeons of England; Member of the National Radium Commission and Trust; Consultant in Surgery to the Royal Air Force, with a foreword by Sir Ernest Rock Carling, F. R. C. P., F. R. C. S., F. F. R., Consulting Surgeon and Vice President, Westminster Hospital. Vol. 1, 2d edition. 357 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1948. Price \$12.50.

on the basis of the broad aspect of clinical practice rather than from the more narrow viewpoint of a highly specialized branch of internal medicine.

Great strides have been made in this field of medicine in the past few decades. Therefore, it is essential that a carefully compiled bibliography such as is presented in this textbook be available for the student of hematology or for the practitioner—*Lieutenant Commander K P Knudtson (MC) U S N*

**HISTOPATHOLOGY OF IRRADIATION FROM EXTERNAL AND INTERNAL SOURCES** Edited by William Bloom, M D, *Professor of Anatomy, Department of Anatomy and Institute of Radiobiology and Biophysics, University of Chicago* 508 pages, illustrated McGraw Hill Book Co., Inc., New York, N Y, publishers, 1948 Price \$8

In reality the best review of this book is that by the editor, himself, in which he gives a very impartial and honest appraisal of the type of work that was done, the aims, and the accomplishments. To elaborate somewhat more, this book is an original recording of extensive studies done in a field of great interest today. It will be an invaluable aid to workers in the field of radiobiology in general. The book's greatest value is the excellent bibliography of the existing literature up to 1945. The extensive amount of work that was done by the Chicago group and presented in this book will act as the "jumping-off" spot for future work in various other institutions and laboratories. The illustrations are plentiful and well chosen and, in general, are well reproduced by the publisher. The section on blood and blood forming organs is particularly well illustrated by excellent color drawings. These illustrations describe adequately the morphologic changes that take place in the hematopoietic organs. The experimental work is clearly outlined and the results are tabulated in such a way that it is easy to refer to them and understand the data—*Lieutenant Commander E P Cronkite (MC) U S N*

**PHYSICAL MEDICINE IN GENERAL PRACTICE** by William Bierman M D, *Attending Physical Therapist, Mount Sinai Hospital Assistant Clinical Professor of Medicine Columbia University* With a chapter on Medical Rehabilitation by Dr Sidney Licht 2d edition, revised and enlarged 686 pages 310 illustrations Paul B Hoeber, Inc New York, N Y, publishers, 1947 Price \$8

This is an especially useful book for the physician not too familiar with the means and methods of physical medicine. Each agent used in physical medicine is discussed under a separate heading. The physiological rationale for each type of agent used is well discussed. The subjects of physical medicine are covered in clear and concise language. Much of the basic principles and descriptive physics are omitted.

The subject of medical rehabilitation is well covered in a chapter by Sidney Licht. The care of paraplegic and amputee patients is adequately explained. There is also an excellent chapter on occupational therapy.

The final nine chapters of the book deal specifically with physical medicine as applied to diseases of the locomotor, nervous, cardiovascular, digestive, genito-urinary, and respiratory systems, and of the ear, nose, throat, and skin.

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The first edition of this work was published in 1940 and was included in a single volume, while the second and present edition, has been divided into four separate books. Volume I, with which this report is concerned, deals with radium and its effects. It is divided into two parts: (1) The Radioactivity of Radium, which deals with the physical principles of radiation, and (2) The Biological Effects of Radiation, derived from observation of the effects of radiation, and clinical and experimental work utilizing tissue cultures.

The opening discussion of Part I is devoted to general considerations of cancer and radium; it is short and to the point, contains numerous pertinent statements relative to the indications for radium therapy, comparison of results between surgery and radium therapy in certain types of lesions, as well as the use of both forms of therapy in a given case. This discussion represents the opinion of one who is both a surgeon and a radium therapist.

Next is a short chapter devoted to the composition of radium followed by a more lengthy discussion on Technique of Radium Therapy which deals with types of radium application excluding radium teletherapy, and contains some isodose curves.

Under the chapter on Radium Dosimetry, the various methods for measuring the ionization current are considered, including the various types of apparatus. There is also a discussion of surface, cavity, and interstitial methods of radium application. The method of measuring the dosage rate from radium plaques and radium teletherapy are both discussed in separate chapters.

Part II begins with a discussion on radiosensitivity involving the various physical factors that affect the radiosensitivity of tissues, then a short chapter on the mode of action of radiation, based on observations from experimental, clinical, and histological evidence. The effects of radium emanation on normal tissues is discussed in the section which follows, in which the effects on various types of tissue are discussed. Next, is a general discussion of the effect of radium on malignant tumors, as determined by microscopic examination of serial biopsies, and a classification of tumors derived from their relative radiosensitivity. It amply illustrates the importance of doing serial biopsies during the course of treatment.

A new chapter entitled "Tissue Culture and Experimental Radiology" written by F. G. Spear, M. A., M. D., D. M. R. E., has been added at this point. It deals with observations on the effects of radiation upon tissues cultivated "in vitro." Comparison of the effects of continuous irradiation with that of spaced doses on cultures under varying conditions is given in this chapter, together with similar observations on tissues "in vivo."

The final chapter deals with "The Dangers of Radium and Protection" as applied to the patient and to the radium worker. To better illustrate the importance of observing proper safeguards, 20 case histories are given.

In general, the book appears to be well written by one who is amply qualified to write on all phases of the subject. Not only has the author drawn his conclusions from a wide personal experience, but he also seems to have a rather broad acquaintance with the literature on this subject. It is a good book on which to lay the foundation for a working knowledge of the application of radium, and is written in a clear and concise style. The print is good size for reading and the paper and binding are of good quality.—Commander C. D. Burroughs (MC) U. S. N.

## BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

**DISEASES OF THE NERVOUS SYSTEM**, by W. Russell Brain, D. M. (Oxon.), F. R. C. P. (London), *Physician to the London Hospital and to the Maida Vale Hospital for Nervous Diseases, Sometime Neurologist to the Infants' Hospital and Physician to the Royal London Ophthalmic Hospital, Theodore Williams Scholar in Physiology in the University of Oxford, Price Scholar in Anatomy and Physiology at the London Hospital*. 3d edition. 987 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$10.75.

**LIVING ANATOMY**, A Photographic Atlas of Muscles in Action and Surface Contours, by R. D. Lockhart, M. D., Ch. M., *Regius Professor of Anatomy, University of Aberdeen; Formerly Professor of Anatomy, University of Birmingham, Examiner in Anatomy to the Universities of Aberdeen, Birmingham, Glasgow, Manchester, St. Andrews, and Sheffield, the Conjoint Board of the Royal Colleges of Physicians and Surgeons, and the Chartered Society of Physiotherapy*. 71 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1948. Price \$4.

**ADOLESCENCE PROBLEMS**, A Handbook for Physicians, Parents, and Teachers, by William S. Sadler, M. D., F. A. P. A., Chicago. *Consulting Psychiatrist, Columbus Hospital; Fellow of the American Psychiatric Association, The American Medical Association, The American Association for the Advancement of Science, Member of the American Psychopathological Association*. 466 pages. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$4.75.

**MANUAL OF THE INTERNATIONAL STATISTICAL CLASSIFICATION OF DISEASES, INJURIES, AND CAUSES OF DEATH**. Sixth Revision of the International Lists of Diseases and Causes of Death Adopted 1948. Vol. I. World Health Organization, Geneva, Switzerland, publishers, 1948.

**FUNDAMENTALS OF BODY MECHANICS AND CONDITIONING**, An Illustrated Teaching Manual, by Mabel Lee, B. S., LL. D., *Professor of Physical Education and Director of Physical Education for Women, University of Nebraska*, and Miriam M. Wagner, B. A. M. A., *Assistant Professor and Director of Health and Physical Education, University of Kansas City*. 377 pages with 70 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$4.50.

**NEOPLASMS OF BONE AND RELATED CONDITIONS**. Their Etiology, Pathogenesis, Diagnosis, and Treatment, by Bradley L. Coley, M. D., *Attending Surgeon, Bone Tumor Department, Memorial Hospital for Cancer and Allied Diseases, Assistant Professor of Clinical Surgery, Cornell University*. 622 illustrations and 53 tables. Paul B. Hoeber, Inc., New York, N. Y., publishers, 1949. Price \$17.50.

**THE EPIDEMIOLOGY OF HEMOLYTIC STREPTOCOCCI During World War II in the United States Navy**, by Alvin I. Coburn, M. D., *The Rheumatic Fever Research Institute, Northwestern University Medical School*, and Donald C. Young, M. D., *Medical Director, Communicable Disease Service, Herman Kleber Hospital*. 220 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$4.

**BRITISH SURGICAL PRACTICE**, Vol. 5 under the general editorship of Sir Ernest Rock Carling, F. R. C. S., F. R. C. P., *Consulting Surgeon, Westminster Hospital*, and J. Paterson Ross, M. S., F. R. C. S., *Surgeon and Director of Surgical Clinical Unit, St. Bartholomew's Hospital, Professor of Surgery, University of London*. In 8 volumes. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$15.

**MEDICAL ETYMOLOGY**, The History and Derivation of Medical Terms for Students of Medicine, Dentistry, and Nursing, by O. H. Perry Pepper, M. D., *Professor of Medicine, University of Pennsylvania*. 263 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$5.50.

**CURRENT THERAPY 1949**, Latest Approved Methods of Treatment for the Practicing Physician. Howard P. Conn, M. D., Editor. Consulting Editors: M. Edward Davis; Vincent J. Derbes; Garfield G. Duncan; Hugh J. Jewett; William J. Kerr; Perrin H. Long; H. Houston Merritt; Paul A. O'Leary; Walter L. Palmer; Hobart A. Reimann; Cyrus C. Sturgis; and Robert H. Williams. 672 pages. W. B. Saunders Co., Philadelphia, Pa., publisher, 1949. Price -10.



- THE EPITOME OF ANDREAS VESALIUS**, Translated from the Latin with Preface and Introduction by L. R. Lind Ph D *University of Kansas* with Anatomical Notes by C W A-Jing M D Ph D *University of California* and a Foreword by the late Logan Clendenen M D 163 pages of translation and 28 pages of Latin text. The Macmillan Co. New York, N Y, publishers, 1949. Price \$7.50.
- BLOOD TRANSFUSION** edited by Geoffrey Keynes. 8 contributors. 574 pages, illustrated. The Williams & Wilkins Co. Baltimore Md. publishers 1949. Price \$12.50.
- PUBLIC HEALTH IN THE WORLD TODAY** edited by James Stevens Simons, *Brigadier General, U S Army, Retired, Dean Harvard School of Public Health*; Assistant Editor Irene M Kenney with Foreword by James Bryant Conant *President of Harvard University* 22 contributors. 332 pages, illustrated. Harvard University Press, Cambridge Mass., publishers 1949. Price \$5.
- INDUSTRIAL TOXICOLOGY** by Alice Hamilton M D *Assistant Professor Emerita of Industrial Medicine Harvard School of Public Health Boston Mass.* and Harriet L. Hardy M D *Physician to the Division of Occupational Hygiene Massachusetts Department of Labor and Industries Assistant in Medicine Massachusetts General Hospital Boston Consultant Los Alamos Scientific Laboratory University of California, Los Alamos N Mex. Instructor Department of Industrial Hygiene, Harvard School of Public Health Boston Mass.* 2d edition revised and enlarged. 574 pages. Paul B Hoeber Inc., New York N Y publishers 1949. Price \$7.50.
- THE ADRENAL GLAND** by Frank A Hartman Ph D *Research Professor of Physiology the Ohio State University* and Katharine A Brownell Ph D *Instructor in Physiology, The Ohio State University Columbus Ohio* 561 pages, 72 illustrations. Lea & Febiger Philadelphia Pa. publishers, 1949. Price \$12.
- THE KINESIOLOGY OF CORRECTIVE EXERCISE** by Gertrude Hawley M A *formerly Head of Corrective Gymnastics at Stanford and Northwestern Universities* 2d edition thoroughly revised. 192 pages with 107 illustrations. Lea & Febiger Philadelphia, Pa. publishers, 1949. Price \$3.75.
- MANUAL OF CLINICAL LABORATORY METHODS** by Opal Hepler, Ph. D., M. D. *Associate Professor of Pathology, Northwestern University Medical School, Director of the Clinical Laboratories of the Montgomery Ward Clinics and Parkland Memorial Hospital; Consultant in Clinical Pathology at Children's Memorial Hospital Chicago, Ill., with a foreword by James P Simmonds, Ph D, M D 4th edition.* 387 pages, illustrated. Charles C Thomas, Springfield Ill., publishers, 1949. Price \$8.50.
- THE PREMATURE INFANT**, Medical and Nursing Care by Julius H Hess, M D, *Professor Emeritus, Department of Pediatrics, University of Illinois College of Medicine Senior Attending Pediatrician Michael Reese Hospital and Consulting Pediatrician Cook County Hospital* and Evelyn C Lundeen E N *Superior Premature Infant Station, Sarah Morris Hospital Station of Michael Reese Hospital Chicago* 2d edition. 351 pages, illustrated. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1949. Price \$6.
- A TEXTBOOK OF ORAL PATHOLOGY** by Thomas J Hill D D S, *Professor of Clinical Oral Pathology and Therapeutics, Western Reserve University, Cleveland Ohio* 4th edition, thoroughly revised. 398 pages, with 314 engravings. Lea & Febiger, Philadelphia, Pa. publishers, 1949. Price \$7.50.
- REVIEW OF DENTISTRY Questions and Answers**. Edited by James T Glan, B. S. D D S, *Professor and Chief of Division of Operative Dentistry, Professor of Oral Medicine, University of Tennessee College of Dentistry, Memphis, Formerly Assistant Professor of Pathology, Histology, and Radiology, Loyola University of the South School of Dentistry, New Orleans, Formerly a Carnegie Fellow in Dentistry University of Rochester School of Medicine and Dentistry, Rochester, N Y.* 810 pages. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$5.75.



## CONTROL OF CANCER CELL SPREAD

Although the microscopic identification of cancer cells in venous blood is notoriously difficult, recent reports confirm the finding of Tyzzer 60 years ago that cancer cells do circulate widely and that manipulation of a tumor at the time of operation may increase dissemination. The microscopic examination of surgical specimens, moreover, demonstrates the presence of venous invasion by cancer cells in 25 to 30 per cent of cases. Further evidence of the prevalence of venous spread of disease lies in the clinical fact that four of five patients dying of colon cancer do so as a result of distant bloodborne metastases. It seems reasonable, therefore, that until such time as more specific chemotherapeutic agents become available, efforts at mechanical control of cell spread during operation should be continued. In a teaching hospital it is not always easy to set up the precise anatomic blockage described by Turnbull, Kyle, Watson, and Sprate.<sup>14</sup> The initial accurate identification and occlusion of the primary lymphovascular pedicle draining the area of disease, however, should always be possible. Final division of the vessels may be done later, at a level proximal to the initial occlusion.

Local contamination of gloves, gauze, and instruments with cancer cells should be avoided by the early enclosure of the tumor in a gauze covering. Cancer cell spread via the intramural lymphatics may be satisfactorily encompassed by extending the resection margin to no less than 12 cm proximal and distal to the tumor. An exception to this may be made in the case of intraperitoneal rectal cancers, where, as noted above, early lymph flow is primarily cephalad.

Tape ligatures should be placed about the intestine above and below the tumor in an effort to control intraluminal spread, when possible. Various clamps have been devised for this maneuver. We have not practiced the intraluminal instillation of 5-fluorouracil, as described by Rousselot et al.<sup>15</sup> In low colon lesions, where application of the distal tape is impossible, a No. 26 Foley catheter is placed in the rectum preoperatively. Sterile tap water irrigations are begun, only after the application of the proximal right angle clamp, with the intent of destroying desquamated cells lying on the rectal mucosa. Encouraging reports from Golligher et al.<sup>16</sup> and Cole<sup>8</sup> attest to the value of this maneuver in preventing suture line recurrent disease.

## COMPLICATIONS OF CANCER OF THE COLON

### Perforation

For many years cancers which had perforated were considered thoroughly hopeless. More recent reports, however, indicate that an encouraging 5 year salvage is possible if these tumors are approached aggressively.<sup>7</sup> Bacterial peritonitis has been shown responsible for most of the fatalities, and its control should be the chief concern of the surgeon. Massive peritoneal implantation of tumor has not been found to be the case, and there is some evidence to suggest that the inflammatory

response engendered by the peritonitis may actually retard implantation and growth of cancer cells. In the care of these patients, efforts should be directed at the control of peritonitis by elimination of the source of contamination, vigorous antibiotic therapy, and general preoperative and postoperative support. In many instances these individuals with perforation will be found neglected and depleted, and strenuous supportive measures are necessary from the start.

It has been our experience that resection and anastomosis should be performed whenever the patient's condition permits. Although the danger of intestinal suture in the presence of peritonitis has been emphasized by Alik et al.,<sup>3</sup> Dunphy (personal communication), and others, the morbidity and operative mortality of simply diverting or bypassing the area of disease outweigh the hazard of anastomotic leakage. Right colon lesions in particular lend themselves to resection and immediate anastomosis.

Free perforation of the left colon requires resection for the removal of the offending source of contamination, and the "turn-in" procedure, described by Hartmann many years ago, may be the operation of choice. The required mesentery can usually be removed at this time; and at a later date, bowel continuity may be re-established should the patient's subsequent course permit. The preferred treatment of perforation of the left colon with local abscess formation, on the other hand, is resection and primary anastomosis, if there is no element of obstruction of the proximal bowel. This method of management is particularly feasible if the abscess lies on the wall or in the mesentery of the bowel. A preliminary diverting transverse colostomy may be indicated in some situations, but only after laparotomy and an accurate assessment of the local pathology has been made. Blind colostomy or cecostomy is rarely a wise procedure.

Perforation with formation of a fistula into an adjacent viscus is usually not an emergency, regardless of its position in the colon. A period of time may be spent prior to resection and anastomosis for hyperalimentation and general improvement in the patient's status. Data from our hospital indicate that *this group of patients, when the disease is found to be localized, may be operated upon with a 5 year survival of 50 per cent expected.*

Drains should be employed as infrequently as possible. Sepsis within the peritoneal cavity may be controlled by lavage at the time of operation and the pre- and postoperative antibiotic administration. The wound must be protected at the time of surgery, and final closure of the skin and fat should be delayed 3 or 4 days. Too often we have discovered the only locus of recurrent disease to be the site at which drains made their exit through the abdominal wall.

## Obstruction

Carcinoma of the large bowel producing clinically important obstruction presents special problems. Not only is the proximal colon filled with fecal material, but the bowel itself is dilated, edematous, and incapable of holding sutures. For many years, staged operations have been the proce-

dures of choice in this situation. Operative mortality at our institution in the past has been 21 per cent, and the 5 year survival rate has been found to be half that of the cancer population at large.

More recently, with improvements in anesthesia and antibiotics and the use of intravenous colloids, the management of these cases has also been modified. Particularly in the case of right colon obstructions, the morbidity and mortality of a preliminary ileotransverse colostomy has been found high. A common complication of this procedure in years past has been the entrapment of small bowel between the mesenteries of the ileum and transverse colon, necessitating an early secondary operation. In eliminating the two stage management of this locus of obstruction, 12 to 24 hours are now devoted to evaluation and preparation of the patient, and a primary resection and anastomosis undertaken. Aspiration of the distended cecum on the operating table may facilitate the procedure. Although an end-to-side ileotransverse colostomy is a safer anastomosis in most hands, in approximately one-third of patients the ileocecal valve will be found to be incompetent, and the small bowel shares in the dilation. In such circumstances an end-to-end suture is technically feasible.

Although cecostomy, for obvious reasons, has no place in the management of right colon obstruction, preliminary decompression by this means may have a limited use in transverse colon lesions, particularly if the obstruction is proven on barium enema to be in the left transverse bowel. Here a primary resection of the entire right and transverse colon may be hazardous, and preliminary decompression through a right transverse colostomy may compromise an adequate resection later. Cecostomy as a decompressive measure in general has fallen into disrepute in recent years, but we believe it may have a limited use when the obstruction is found in the left transverse colon.

Intestinal suture should never follow resection of obstructing lesions of the left colon. The incidence of anastomotic leakage is forbidding, and we prefer preliminary decompression via a transverse colostomy. Using a large bore needle, aspiration of gas is often possible, and a loop or double-end colostomy established. We prefer the double-end colostomy as it ensures the satisfactory preparation of the left colon for the later resection. Rarely should the transverse colostomy be closed at the time of resection of the tumor because of the hazards of two anastomoses.

Occasionally, in the better risk patient, an obstructive cancer of the left colon may be removed at the initial operation by performing a Hartmann type procedure, including excision of the required segment of mesentery. Restoration of bowel continuity may later be undertaken as a secondary operation at a time of election.

## POSTOPERATIVE CARE

the anastomosis as is the lack of tension at the suture line, the adequacy

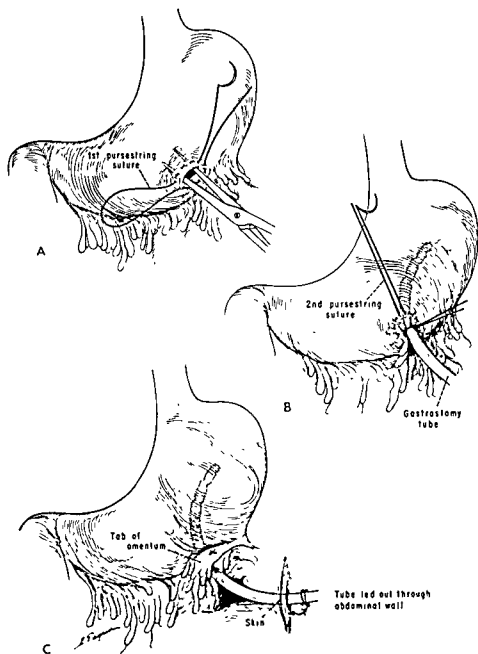


Figure 8 Gastrostomy for decompression of stomach and small bowel, following colon surgery

A. Blunt scissor dissection of the vascular stomach wall is less likely to cause bleeding than is a knife puncture

etal peritoneum. A single suture of silk at the skin level encircles the catheter and secures it to the abdominal wall.

of blood supply, and the preoperative mechanical cleansing of the bowel lumen. For years, nasogastric suction has been relied upon to provide removal of swallowed air and saliva. More effectual and reliable in our hands is the placement of a gastrostomy drainage catheter, the technique of which is demonstrated in Figure 8. The number 16 whistle tip latex catheter is allowed to drain freely without suction for 2 to 4 days, until the return of peristalsis. Intermittent clamping of the tube is then begun, as liquids are allowed by mouth. In no instance should the catheter be removed before the 10th or 11th postoperative day, at which time the gastrostomy fistulous tract is firmly sealed.

## RADIATION AND CHEMOTHERAPY

Little has been said of the preoperative or postoperative use of radiation or of chemical agents. Control studies assessing the effectiveness of these adjunctive modalities on colon cancer are nonexistent. Radiation at our institution has been found effective only on cancers of the rectum, including the intraperitoneal segment. It has been used preoperatively to reduce the size of large tumors and postoperatively in instances where the surgical specimen demonstrated spread of cancer cells to perirectal fat and lymph nodes. Chemotherapy in the form of 5-fluorouracil has found its chief use postoperatively, in the case of liver metastases found at the time of bowel resection. Administered orally or parenterally its value remains unproven. The future may provide more cancer-specific chemical agents and more sophisticated methods of roentgenotherapy to help in the control of colon cancer.

## REFERENCES

1. Allen, A. W., Donaldson, G. A. and Welch, C. E. Modern trends in colonic surgery. *Surg. Clin. N. Amer.* 29:1421, 1949.
2. American Cancer Society. Cancer Facts and Figures 1960-73. New York, U.S. Bureau of the Census. U.S. Government Printing Office, Washington, D.C.
3. Attk, M., Castleberry, J. W., Warner, J. C. and Cohn, I. Jr. An experimental study of primary anastomosis of the obstructed colon. *Surg. Gynec. Obstet.* 110:697, 1960.
4. Basmajian, J. V. Main arteries of the large intestine. *Surg. Gynec. Obstet.* 101:583, 1955.
5. Burkitt, D. P. Epidemiology of cancer of the colon and rectum. *Cancer*, 28:3, 1971.
6. Cole, W. Recurrence in carcinoma of the colon and proximal rectum following resection for carcinoma. *Arch. Surg.* 65:264, 1952.
7. Donaldson, G. A. The management of perforative carcinoma of the colon. *New Eng. J. Med.* 258:201, 1958.
8. Figiel, L. S., Figiel, S. J., and Hennessey, A. Carcinoma of the colon. Incidence of error in the roentgen diagnosis. *Amer. J. Gastroent.* 40:487, 1963.
9. Gilchrist, R. K., and David, V. C. Lymphatic spread of carcinoma of the rectum. *Ann. Surg.* 108:621, 1938.
10. Goligher, J. C., Dukes, C. E., and Bussey, H. J. R. Local recurrences after sphincter saving excisions for carcinoma of the rectum and recto-sigmoid. *Brit. J. Surg.* 39:199, 1951.
11. Grinnell, R. S. Lymphatic metastases of carcinoma of the colon and rectum. *Ann. Surg.* 131:494, 1950.
12. Moynihan, B. The Cavendish Lecture. Being Remarks on the Surgery of the Large Intestine. *Lancet* 2:1, 1908.
13. Peloquin, A. B. Cancer of the colon and rectum. Comparison of the results of three groups of surgeons using different techniques. *Canad. J. Surg.* 16:1, 1973.
14. Phillips, J. W., Waugh, J. M., and Dockerty, M. B. Surgical significance of regional lymphatic drainage of the hepatic flexure. *Surg. Gynec. Obstet.* 99:455, 1954.

- 5 Rousselot, L. M., Cole, D. R., Slattery, J., Grassi, C. E., and Gonzalez, E. M. Intra-luminal chemotherapy adjuvant (HN<sub>2</sub> or 5-F-U) to operation for cancer of the colon or rectum. *Ann Surg*, 162:407, 1965
- 6 Steward, J. A., and Rankin, F. W. Blood supply of large intestine. *Arch Surg*, 26:843, 1933
- 7 Sugarbaker, E. D. Coincident removal of additional structures in resection for carcinoma of the colon and rectum. *Ann Surg*, 162:1022, 1965
- 18 . . . . . influence of
- 19 . . . . . Med Res., 28:309, 1913
- 20 Welch, C. E., and Burke, J. F. Carcinoma of the colon and rectum. *New Eng J Med*, 266:211, 1962
- 21 Welch, C. E., and Giddings, W. P. Carcinoma of the colon and rectum. *New Eng J Med*, 244:859, 1951
- 22 Welch, J. P., and Donaldson, G. A. Recent experience in the management of cancer of the colon and rectum. *Amer J Surg*, 127:258, 1974

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# Adenocarcinoma of Colon and Rectum

## Role of Radiation Therapy

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Carcinoma of colon and rectum is the most common cancer in our country. For our population, the incidences of several of the more frequent carcinomas in 1972 are estimated by the American Cancer Society<sup>12</sup> as follows: colon-rectum, 76,000 cases; lung, 76,000 cases; breast, 70,600 cases; uterus (cervix and corpus), 43,000 cases; and prostate, 36,000 cases. The mortality figures for colorectal carcinoma are disappointingly high. For example, of 21,000 patients with carcinoma of the rectum, half of them would die. The comparable figures for carcinoma of the colon are 36,500 fatalities in 55,000 patients, a failure rate of 66 per cent. This is despite the fact that a large proportion of the patients receive radical surgical treatment (often requiring a permanent colostomy).

Radiation therapy so far has not had a major role in the management of this group of patients. I think that there is now abundant evidence that this situation should be reconsidered and that a much increased responsibility in the care of selected categories of these patients should be assigned to radiation therapy, particularly in two situations: (1) small and well differentiated carcinomas of the rectum, which can now be successfully treated by a simple endorectal radiation therapy technique (small field, low kv); and (2) selected lesions of the sigmoid and lesions of the rectum which are planned for definitive surgical attack; they should in most instances be considered for combined radiation therapy and surgery. This paper presents the policies of management by the Department of Radiation Medicine at the Massachusetts General Hospital. They represent an appreciable departure from our past policies.

### DEFINITIVE TREATMENT OF EARLY ADENOCARCINOMA OF THE RECTUM BY RADIATION THERAPY ALONE

The proposal is made here that as an option to radical surgery, well-differentiated adenocarcinomas of the rectum that are less than 3 cm in

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diameter and within 10 cm of the anal verge be treated by radiation therapy alone. This proposal is based upon a careful consideration of the results of surgery and the results achieved by Papillon in such lesions by radiation therapy alone.<sup>10</sup> Papillon reported an absolute disease-free 5-year survival of 68 per cent of 123 patients, his patients were largely elderly or with medical problems making them poor surgical risks. His technique was simple: 2 or 3 treatments in the outpatient clinic (no anesthesia). Because of the simplicity of the procedure, the excellent results, and the negligible morbidity, this clearly warrants testing in other hospitals.

### Surgical Survival Rates

Five-year survival figures for patients with carcinoma of the rectum, Duke's Stage A and B, that were treated by curative resection were 40 of 55 patients (73 per cent) and 50 of 106 (47 per cent) respectively in the Columbia-Presbyterian series.<sup>11</sup> Where invasion of the regional lymph nodes was demonstrated histopathologically, the 5-year survival figures were 3 of 5 for Stage AC, 44 of 130 (34 per cent) for Stage C1 and 6 of 46 (13 per cent) for Stage C2. Survival rates for carcinoma are only weakly dependent upon size of tumor. For example, 5-year survival rate in patients subjected to curative resection for primary bowel carcinoma was 55 per cent of 103 patients with lesions less than 3 cm in diameter, 45 per cent for 521 patients with lesions 3 to 6.9 cm and 43 per cent of 101 patients whose lesions were  $\geq 7.0$  cm. A highly important factor in prognosis is histopathologic grade as shown initially by Duke. In the Columbia series, lymph node metastases were demonstrated in specimens from 50 to 60 per cent of patients with Grade I and II but in 90 to 95 per cent of the patients with Grade III lesions. The distribution of histopathologic grade was independent of tumor size, some 30 per cent of the lesions being scored as Grade I, 55 per cent as Grade II, and about 15 per cent as Grade III for lesions  $\leq 3$  cm, 3 to 6.9 cm, and  $\geq 7$  cm in diameter. Glenn and McSherry<sup>4</sup> have analyzed a series of 1026 patients with carcinoma of the distal large bowel treated at Cornell Medical Center. There were 666 "curative" procedures which included 422 abdominal-perineal resections. They reported the following 5-year survival figures for patients whose lesions were  $\leq 10$  cm above the anus: 54 per cent of 100 Stage A patients and 30.7 per cent of 75 Stage B patients. In summary, among those patients with adenocarcinoma of rectum who were considered *acceptable* surgical risks, the survival figure for Stage A carcinoma of the rectum is approximately 70 per cent.

### Radiation Therapy Survival Rates

possible; the assumption must be made that although most lesions were Stage A, some were more advanced. These patients were candidates for classical abdominal-perineal resection, but in general were considered to

be poor surgical risks for such a major procedure because of age or significant renal, cardiovascular, or pulmonary problems, and hence were referred for a less trying treatment modality. As mentioned earlier, an absolute 5-year (disease-free) survival figure of 68 per cent was achieved in 123 patients. In addition, five patients survived after surgical resection of a local recurrence, yielding a total of 89 of 123 patients or 72 per cent alive at 5 years. Of the 34 patients who did not survive 5 years, 16 died of intercurrent disease while 18 died as a consequence of their rectal cancer. In 8 of these 18 failures, the problem was metastatic disease with freedom of disease in the pelvis. Ten of 123 had failure to obtain destruction of the pelvic disease and subsequently died. Five patients had successful resection of their recurrent cancer. Surgery can thus be performed with good effect after the local treatment. The total number of local failures was 15 of 123 or 12 per cent. Thus, in a series of 123 patients with proven adenocarcinoma of rectum, there were 84 patients alive and free of disease at 5 years with complete preservation of rectal function. There was no mortality, no perforation, no fistula, and no stricture. These figures are exciting because the entire treatment procedure is performed in the outpatient department in three simple sessions. Neither anesthesia nor sedation is required. Complications have been virtually zero. Of great importance to the patient is the retention of normally functioning and nonsymptomatic rectum. The survival data are comparable to those which are currently being achieved by application of radical surgical procedures, but with superior functional results.

### Radiation Therapy Technique

This success has come from careful and skillful application of soft x-ray technique (50 kv) to a special clinical situation. Physical factors are 50 kv, 4 cm target surface distance, low penetration of beam, and very high dose rate. The x-ray tube is hand held; and it is positioned directly over the tumor under direct control; total treatment time is less than 1 minute. Doses have been  $\approx 2500$  to 3000 rads to surface of lesion (end of applicator) for each of 3 treatments given over a total time period of 3 to 4 weeks. In concept the approach is simple and direct. Its effectiveness is *almost predictable considering the radiation dose levels, field size, and x-ray characteristics*. These well differentiated carcinomas are well circumscribed and there is minimal infiltration along the mucosa. This situation permits application of *small, well-defined treatment fields*; usually only a few millimeters of surrounding normal mucosa are treated. As the lesions are small, the healing of the diseased area is prompt and is complete in almost all instances. There has been no coverage of regional lymph nodes except for the paracolic node(s) immediately adjacent to the disease area. I have visited Papillon's clinic, personally examined 29 patients at follow-up clinic, and accept that the results are valid and outstanding.

### Electrocoagulation

Electrocoagulation is a local procedure which has enjoyed some favor as an option to radical surgery over a very long time period for the small, well-differentiated lesions of rectum. This has been recently dis-

cussed by Madden and Kandalaft.<sup>7</sup> Several comments on the electrocoagulation procedure are offered here. The electrocoagulation procedure is more arduous than the endocavitary beam therapy; the average number of coagulation procedures is four. Each requires hospitalization and anesthesia. The actual time of the technique is 75 minutes per procedure. In their total experience with 77 patients, 22 or 28.5 per cent have had a complication. The most frequent complication was hemorrhage; in 7 cases operative hemostasis was required. In two patients there was perforation into the peritoneal cavity treated by suture closure and transverse colon colostomy or by radical resection. Finally, two patients had rectovaginal fistula and a single patient had pulmonary embolus.

The advantages appear to be with the endocavitary 50 kv technique. We have now obtained a new kv x-ray equipment for this special purpose and are accepting patients for this treatment approach: low grade adenocarcinomas  $\leq 3$  cm in diameter and within 10 cm of the anal verge. This approach is judged to represent an alternate to abdominal perineal resection.

### COMBINED RADIATION THERAPY AND SURGERY FOR LARGER OR HIGHER POSITIONED LESIONS OF THE SIGMOID-RECTAL REGION

Radical surgery for carcinoma of the colon yields results vastly superior to those obtained in an earlier era when simple excision was employed. Even so, there is a high proportion of failures: these are in the form of distant metastases or pelvic recurrence or both. Here, consideration is given to the prospects for further improvements of these results by combining radiation therapy and surgery instead of relying upon the surgical procedure alone. Particular emphasis will be directed to the problem of the local pelvic recurrence.

#### Pelvic Recurrence

A clinically important proportion of patients experience recrudescence of disease within the pelvis despite the fact that they have submitted to an aggressive surgical procedure that, in addition to a nontrivial mortality and complication rate, leaves the patient with a permanent colostomy. Patients presenting with regrowth of colon or rectal carcinoma in the pelvis have a grievous problem because the various modalities of treatment available rarely succeed in more than limited palliation. These patients are often in pathetic circumstances because of severe pain secondary to involvement of nerve or bone, tumor masses in the pelvis with extension through the perineal floor or abdominal wall, or edema of the limbs or genitalia.

*The position taken in our department is that this complication can be severely reduced in frequency by combining irradiation therapy with surgery. That is, the effort should be directed toward preventing a recurrence, rather than attempting to eradicate the regrowing tumor. The like-*

likelihood with which local recurrence develops following highly skilled surgery is closely dependent upon the anatomic site of the lesion, histopathologic grade of tumor, surgical stage of the lesion, and extent of local spread. In the study of Morson and Bussey,<sup>9</sup> local recurrences were noted in 15 per cent, 8 per cent, and 5 per cent of patients whose primary tumor has been located in the lower, middle, and upper third of the rectum, respectively. Incidence of local recurrence was correlated with histopathologic grade: 5.7 per cent, 7.5 per cent, and 19.7 per cent for patients whose lesions were graded as low, average, or high, respectively. Further, local recurrences were more common with higher stage lesions: 2 of 247 Stage A patients, 31 of 583 Stage B patients, and 122 of 762 (16 per cent) of Stage C patients. Finally, local recurrence likelihood went up with extent of local spread: 0.9 per cent, 5.9 per cent, and 16.8 per cent for nil, slight, and extensive local spread of tumor. Patients in that study have experienced the lowest incidence of locally recurrent tumor that I have seen reported. Glenn and McSherry<sup>6</sup> reported that 88 of 422 (20.9 per cent) patients were documented to have perineal recurrence following abdominal-perineal resection. Bacon<sup>3</sup> counted local recurrence in 17.5 per cent of 502 patients after abdominal-perineal resection. At his institution following those procedures that avoided an abdominal colonic stoma, the local recurrence rate was even higher, viz., 18 to 30 per cent. Butcher<sup>4</sup> has also emphasized the position of the lesion above the anal verge as a highly important factor with respect to local prognosis. He observed local recurrences after the classical abdominal-perineal resection in 19.8 per cent of 172 patients with lesions 6 to 10 cm and 14.5 per cent of 76 patients with lesions 11 to 16 cm above the anal verge, respectively.

These data from major centers for bowel surgery indicate that a local recurrence rate of 12 to 15 per cent for rectal carcinoma treated by radical surgery (leaving a permanent colostomy) is a realistic and average good figure. Regardless of the exact figure the reader may prefer for this complication rate, the current surgical experience clearly demands a serious effort to reduce the magnitude of this problem. If this can be accomplished without increasing morbidity, then a new approach should be strongly supported. The situation is even better if ultimate survival rates are higher. In our opinion the first of these goals can almost certainly be met and perhaps the second by administration of 5000 rads in 5 to 6 weeks some 4 weeks before surgery is performed. Treatment volume should include the primary lesion and pelvic regional lymph nodes.

### Radiation Therapy Results

What justification exists for this degree of optimism? With respect to clinical data there is an important paper by Allen and Fletcher describing experience with 51 patients treated by radiation therapy followed by radical surgery.<sup>2</sup> In their protocol 5000 rads in 6 weeks were delivered by supervoltage techniques employing small fields ( $\approx 10 \times 10$  cm portals). This treatment was judged to be well tolerated and not to increase significantly the difficulty of surgery or to increase complication rate. For me, the most important fact from their study is that not a single patient has been observed to have recurrence of tumor in the pelvis. Gross reduction

of tumor mass to some degree was a regular finding. In 8 of 16 patients classed as unresectable, the lesion became "resectable" after treatment. One of these 8 patients survives free of disease after the combined procedure. Also of interest is the fact that histologic evidence of disease in the surgical specimen was lacking in five instances. In a further five specimens, only foci of "carcinoma in situ" could be found.

Obviously, data from one series of 51 patients do not establish the efficacy of radiation therapy for the purpose proposed. However, the basic idea is quite sound from our knowledge and experience in clinical radiation therapy and laboratory work in radiation biology. Firstly, consider that we are requiring the radiation dose to inactivate only those tumor cells which might be spilled into the surgical field (e.g., tumor cell containing lymph fluid) or small foci of established tumor beyond the surgical margin. The bulk of the tumor is, of course, removed with the surgical

example, 4000 to 4500 rads in 4 weeks given to the internal mammary

at various sites in the head and neck region and metastases to pelvic lymph nodes from primary carcinoma of the uterine cervix. This material has been discussed in detail in a comprehensive and recent article by Fletcher<sup>5</sup>

There are reports now of results of preoperative irradiation for several anatomic sites where a marked reduction or virtual elimination of

tolerated and the incidence of local regrowth of tumor in the neck was markedly suppressed. Miller and Johnson<sup>6</sup> have compared the results of

rodent tumors if moderate doses of radiation have been given beforehand.

Another type of datum pertinent to this discussion is the number of lymph nodes in the surgical specimens which show metastatic disease following the abdominal-perineal resection in patients who have received radiation therapy before surgery or alone. From prospective clinical trial of preoperative radiation and radical surgery for carcinoma of the rectal region sponsored by the Veterans Administration, Roswit et al.<sup>12</sup> have reported that metastases in lymph nodes were found in 27 per cent of the specimens from patients subjected to preoperative radiation therapy and surgery as compared with 40 per cent of the patients who were subjected to surgery alone. The radiation dose level was very modest (2000 to 3000 rads in 2 or 3 weeks). In a similar trial at Yale, Tepper et al.<sup>17</sup> found that 2 of 8 specimens showed positive lymph nodes in the combined treatment group and 6 of 8 specimens showed positive nodes in the group having surgery alone, radiation was 4500 rads in 4½ weeks. These results provide good support for the claim that, when given preoperatively, ≈ 5000 rads in 5 weeks is adequate to effect an important decrease in local recurrence rate following surgery and is sufficient to inactivate small tumor deposits in regional lymph nodes.

### Preoperative Irradiation

As mentioned earlier, there is a likelihood that survival rates might be increased if radiation were given preoperatively to patients who have abdominal-perineal resection. The evidence on this point is not convincing. Recent data (1973) are those of the Veterans' Administration study (mentioned above) based on 700 patients treated by radiation therapy followed by surgery or by surgery alone. Five-year survival rates are reported as 34.6 versus 28.3 per cent for the combined and the single modality treatment groups, respectively. At Memorial Hospital<sup>17</sup> a similar and earlier study of low dose radiation given preoperatively yielded survival figures of 40 per cent and 47 per cent for the radiation and surgery versus surgery alone. In neither of these reports are data given on frequency of local recurrence in the various treatment groups.

Withers (personal communication) has proposed that there may be a place for the combined approach for lesions so situated that indications for an anterior resection are not definite. That is, use of anterior resection might be extended if the combined treatment approach were employed. Withers and associates are currently testing this approach at M.D. Anderson Hospital.

In summary, we recommend that patients with adenocarcinoma of rectum, excluding small and well-differentiated lesions, should be subjected to preoperative irradiation in the amount of 5000 rads in 5 weeks to be followed by abdominal-perineal resection. For lesions of the rectosigmoid, the combined approach is favored only for high grade or locally extensive lesions, or both.

In my opinion the clear justification for this approach is reduction in frequency of pelvic recurrence, which can confidently be expected. Any benefits in greater disease-free survival rates would be thoroughly welcome but certainly cannot be anticipated with much assurance.



## REFERENCES

- 1 Adams, Y G , Calabrese, C , and Volk H Colo-rectal cancer in patients over 80 years of age. SURG CLIN N AMER 52 883-889 1972
- 2 Allen, C V , and Fletcher, W S Observations on preoperative irradiation of rectosigmoid carcinoma. Amer J Roentgen 108 136-140, 1970
- 3 Bacon, H E Present status of the pull through sphincter preserving procedure Cancer 28 196-203, 1971
- 4 Butcher, H R Carcinoma of the rectum Cancer, 28 204-207 1971
- 5 Fletcher, G H Clinical dose response curves of human malignant epithelial tumours Brit J Radiol 46 1-12, 1973
- 6 Glenn, F , and McSherry, C K Carcinoma of the distal large bowel Ann Surg 163 838-845, 1966
- 7 Madden J L , and Kandalaft S Clinical evaluation of electrocoagulation in the treatment of cancer of the rectum Amer J Surg , 122 347-352 1971
- 8 Miller, L W , and Johnson, D E Megavoltage irradiation for bladder cancer alone postoperative or preoperative? Seventh National Cancer Conference Proceedings Philadelphia, J B Lippincott Co , 1973
- 9 Morson, B C , and Bussey, H J R Surgical pathology of rectal cancer in relation to ad-

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## Rectal Carcinoma

### Abdominoperineal and Anterior Resections

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Unless a patient with rectal cancer is near death from metastatic cancer or concurrent disease of a major organ system, the rectal neoplasm should be removed whenever possible, because aggressive removal of colorectal cancers, even those with local lymph node metastases, seems to increase the survival rate.<sup>12-24</sup> Furthermore, little can be done to ease the tenesmus, pain, and anal discharge of the victim whose cancer is allowed to grow locally.

Although removal of neoplasm in this hospital occasionally means its destruction with radiation<sup>24</sup> or with local fulguration,<sup>7-19</sup> in general it means excision. Excision is almost always accomplished with one of three operations: combined abdominoperineal resection, anterior resection, or Hartmann's operation. The Kraske approach is sometimes used, but a pullthrough is almost never employed—not because of deficiencies in these procedures; rather, the three usual operations have served so well that no one here has come to prefer the others.

### CHOICE OF OPERATION

Patients of normal weight and body build who have a rectal cancer palpable on digital examination should have a combined abdominoperineal section with a sigmoid colostomy;<sup>2</sup> for obese patients or others whose anatomy limits conventional rectal palpation, location of the neoplasm within the distal 7 cm of rectum on sigmoidoscopy is the criterion for abdominoperineal resection. (Measurements differ if made at sigmoidoscopy, at the operating table before or after mobilization of the tumor, and in the pathology laboratory.)

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Patients with cancers more than 14 cm from the anus, above the peritoneal floor, should ordinarily have an anterior resection with restoration of rectal continuity. The requisite margin of normal bowel 5 cm on each side of the tumor to circumvent local spread can be attained, and the distal 7 cm of rectum above the anus can be preserved for continence.

Controversy concerns treatment of neoplasms in the middle third of the rectum, from 8 to 14 cm. A decade ago, when the local recurrence rate after anterior resection was 10 per cent, this operation would have been heresy, but now that recurrence rates can be kept below 2 per cent, it is a procedure appropriate for most patients with cancers of the rectum at this level that do not invade surrounding tissue.<sup>3-25</sup> The key to a low rate of recurrence is preventing implantation of viable cancer cells in the suture line by ligation of the rectum above and below the tumor and by distal irrigation with a cytotoxic solution.

Although these precautions have decreased recurrence rates, other arguments in favor of improved cure and mortality with anterior resection seem less tenable without reports of concurrent, matched sets of patients subjected to anterior resection compared with abdominoperineal resection. Available statistics are weighted in favor of anterior resection, since women, with their wide pelvises, tend to be selected, and women survive longer than men after all comparable modes of treatment,<sup>27</sup> moreover, anterior resection is done for patients with smaller cancers, the larger cancers being more easily removed by abdominoperineal resection. The mortality rates of abdominoperineal resection and anterior resection with end-to-end anastomosis are both in the vicinity of 3 to 10 per cent, anterior resection with side-to-end (Baker) restoration of continuity decreased mortality rate to 1.5 per cent in Zollinger's series.<sup>32</sup>

The most prudent plan is to begin every operation for a middle third rectal cancer as if an abdominoperineal resection were to be done and to convert it to an anterior resection only after being sure that indications are favorable,<sup>30</sup> nonetheless, middle third rectal cancers should be treated by anterior resection whenever the operation is possible. About three fifths of middle third carcinomas are suitable for anterior resection. The most suitable patients are the thin rather than the fat, those with wide rather than narrow pelvises, and women rather than men. Contraindications to anterior resection are mesenteric occlusive arterial disease and cancers of high malignancy.<sup>30</sup>

The Hartmann procedure tends to be reserved for patients with perforated or septic neoplasms, especially if emergency excision is required, and for patients who are poor risks for one of the other operations by reason of extensive metastases, failing health, and massive obesity.

## PREOPERATIVE PREPARATION

### Preparation of the Bowel

The essence is to have a clean, dry rectum and colon at the time of operation. The bulk of colonic contents is limited by a minimal residue diet for a day, followed by a clear liquid diet for the 2 days preceding

operation. Although the so-called elemental diets should be ideal to provide nutrition during this time without producing residue, we have not been convinced of their efficacy.

Laxatives and enemas evacuate the rectum. Saline enemas or soap-suds enemas are chiefly useful between the 4th and the 2nd preoperative days. During the final day, their use is dictated by the reservation that the combination of a vigorous enema and a weak patient may provide soap-suds in the bowel as an intraoperative surprise. Castor oil, 45 ml, at 4:00 p. m. on the 3rd and 1st preoperative afternoons is a major aid to cleansing. Timed in this way, the dosage minimizes nocturnal diarrhea and seems to provide a spastic small bowel, easy to pack away within the abdomen.

Antibiotics are of secondary value. Perhaps the best argument supporting this assertion is the negligible effect on the bacterial population of the colon of the nonabsorbable sulfonamides,<sup>22</sup> which until recently seem to have been the agents most widely used. Neomycin alone is only a little better since it permits growth of anaerobic bacteria that are a frequent cause of postoperative sepsis. If a surgeon decides to use antibiotics, he should probably use either a 2-day preparation of oral neomycin (0.5 gm) and clindamycin (0.3 gm), each four times a day, or intramuscular penicillin and streptomycin begun 8 to 12 hours before operation and continued for a few days.

### Colostomy

Under ideal circumstances the surgeon and the enterostomal therapist should have 3 days for the psychologic and technical preliminaries of planning a colostomy. The potential site should be located the day before it is to be created. Only by examining the patient as he sits, lies, and bends can one choose a site that is comfortable and visible, yet as esthetically located as is possible. Anyone who has examined many patients with colostomies will have seen stomas located everywhere from the mid-axillary line to the pubis when these precautions have not been observed.

A limited number of sites on the abdominal wall is optimal, and these are usually within a hand's breadth of the umbilicus. We prefer a colostomy that is brought through the split left rectus abdominis muscle and a transverse incision in the anterior fascia to terminate in a transverse skin incision, as described by Turnbull and Weakley.<sup>23</sup> Although Turnbull himself now prefers to bring the sigmoid colon through a circular opening at the umbilicus, we like the left rectus location because it minimizes herniation and tends to coapt the walls of the transverse stoma, thereby minimizing the leak of mucous secretion and camouflaging the stoma itself.

### Urinary and Sexual Problems

A preoperative discussion of the genitourinary hazards of abdominoperineal resection may be beneficial to some patients, but it will increase the anxiety of others. In general, there is probably no point in broaching potential urinary difficulties. If they occur, they may be treated by appropriate measures.<sup>17</sup> Adroit handling of the problem of impotence does not lend itself to easy formulation.

## ABDOMINOPERINEAL RESECTION

For surgeons who have not tried it, the advantages of a synchronous abdominoperineal dissection by two teams can scarcely be overemphasized. The cooperative exposure makes virtually every step of resection one carried out under direct view. Besides additional safety for the patient, it provides a lesson in anatomy for the trainee. The techniques of this operation as the authors perform it are so much indebted to developments from St Mark's Hospital, London, and The General Infirmary, Leeds, that we can add only individual touches to Goligher's comprehensive description.<sup>12</sup>

Easy positioning with Lloyd-Davies stirrups is now feasible in this country since the Matburn operating table\* has been imported (Fig. 1). Four instruments† also facilitate the procedure. These are the St Mark's pelvic retractor, which allows visualization of the pelvic depths, Lace's perineal retractor, which permits exposure without the encroaching arm of an assistant, and Riches' diathermy hemostatic forceps, which allows controlled coagulation in the perineum while avoiding the necessity of many individual hemostats obscuring the field (Figs. 2 and 3). Helpful, too, is the modified Berkelev-Bonney self-retaining abdominal retractor or any other with interchangeable deep and shallow blades for three sides.

The first step in the operation is to create the colostomy site, because only at the beginning are the layers of the abdominal wall in proper anatomic relation. A transverse incision 4 cm long is made in the predeter-

\*Eschmann U.S.A. Inc. East Hanover N.J.

†Thackray Ltd. Leeds England

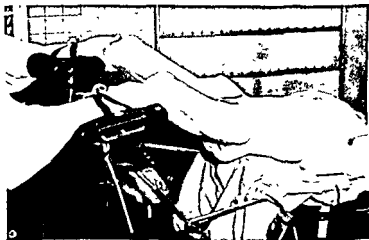


Figure 1 Position of patient for synchronous combined abdominoperineal resection. The thighs are flexed only slightly above the level of the abdominal wall and are abducted enough to permit easy access to the perineum. A support elevates the sacrum. During the abdominal phase of the operation the second assistant stands between the thighs and provides retraction of the bladder and other pelvic structures.

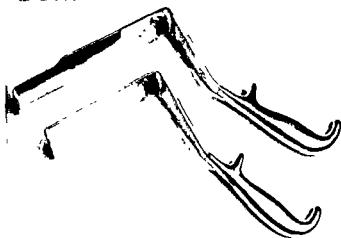


Figure 2 Pelvic retractors

mined spot, the anterior fascia is cut transversely, the rectus is split, and the transversalis fascia is marked. Near the end of the operation enough sigmoid colon will be brought through the completed incision in the transversalis fascia to exteriorize a length about one and one-half times the estimated distance between the anterior fascia and the skin, this length permits the sigmoid to be so completely relaxed that the ultimate stoma will not retract. The end of the sigmoid or descending colon is sutured flush to the skin with catgut to create a gentle funnel from the fascia to the surface.<sup>23</sup> In contrast with the end ileostomy, a bud of everted bowel is not desired.

Every effort must then be devoted to excising the neoplasm, perhaps aided by preliminary radiation therapy.<sup>24</sup>

After the excision is shown to be practicable, two steps should follow: (1) ligation of the bowel with umbilical tape 6 cm above and below the tumor to diminish remote intraluminal seeding of neoplastic cells, and (2) mobilization of enough descending colon to guarantee an adequate

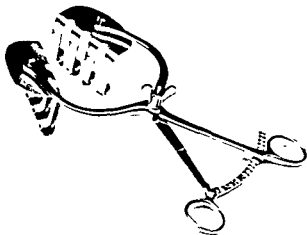


Figure 3 Self retaining perineal retractor

proximal length for construction of the colostomy. Mobilization to the splenic flexure may be necessary in fat patients.

The correct site of arterial ligation has received attention disproportionate to its importance. There is little evidence to suggest greater cure rate following ligation of the inferior mesenteric artery at the aorta with removal of additional lymph nodes involved with cancer at this level.<sup>4, 16</sup> Nonetheless, there is sometimes a technical advantage in high ligation of the artery. Since the inferior mesenteric artery is a reasonably constant  $4.2 \pm 0.8$  cm (standard deviation) above the aortic bifurcation (in fixed cadavers),<sup>17</sup> even if the mesentery is dense and the vessels difficult to identify by inspection, a ligature placed in that area can be made to include the artery. Division of the mesocolon at this point makes the rest of the operation easier, but lower division in the impossibly fat mesentery does not compromise cure.

High ligation of the artery can be harmful only if the collateral circulation to the descending colon is inadequate by reason of an occluded superior mesenteric artery or marginal artery. Arterial bleeding should always be sought at the end of the potential colostomy, for if it is absent, a more proximal resection will be required.

Apart from protection of the ureters, the main concern during mobilization of the rectosigmoid from the pelvis is the integrity of the venous plexus on the concavity of the sacrum. The plane of blunt dissection with the hand should be anterior to these veins. When the veins are inadvertently perforated, either the unpremeditated hypotension that follows or the firm application of dry gauze pads should control hemorrhage. If bleeding recurs when the pads are removed after 5 to 10 minutes, there are three options: first, packing the pelvis with a sheet of rubber dam between the packing and the sacrum, hoping that the dam can later be freed by gentle irrigation without dislodging the clot, second, requesting controlled systemic hypotension as a preliminary to direct suturing of veins, third, repacking the area with dry pads to be removed through the perineal wound under general anesthesia after 3 to 5 days.

Clamping of the middle hemorrhoidal arteries before dividing them

by one team. The synchronous resection, permitting each operator to

The last major problem is what to do with the pelvic chasm at the end of the operation. Traditional teaching has been to mobilize and join leaves of the remaining peritoneum to reconstitute a new pelvic floor. Doing so does not mimic nature, however, for the normal pelvic floor lies deep, in contact with bone, muscle, and fascia, not suspended at a mid-sacral level. Moreover, creating a high peritoneal floor violates the principle of obliterating dead space whenever possible. The inevitable consequence is that the residual cavity beneath is filled with serum and blood, and it must be highly susceptible to infection.

Since reperitonealization of raw surfaces does not occur by migration of existing mesothelial cells, but rather from transformation of undifferentiated cells in the area of denudation into mesothelium,<sup>1, 21</sup> there is no reason to attempt reperitonealization. The small bowel should be allowed to fill the pelvis, obliterating the potential dead space.<sup>21</sup> To avoid perineal evisceration, the perineal wound must be securely closed with an inner layer of stout catgut and an outer layer of interrupted sutures, leaving room only for the drains or suction tubes. There is no reason to restrict walking or other activities beyond limitations normally imposed on patients after any laparotomy.

## ANTERIOR RESECTION

The major threat to anterior resection for cure of cancer is neoplastic recurrence at the line of colorectal anastomosis. Irrigation of the rectum achieves both mechanical removal and biologic inactivation of neoplastic cells below the cancer. Rectal irrigation is done by inserting a large bore soft tube through the anal sphincter before the patient is brought into the operating room and connecting this through a Y-tube to a bottle of irrigating solution and to a drainage pan. A number 26 F Foley catheter with a 30 ml bag partially inflated for anchorage is convenient for this purpose. During the operation, after the ligature of umbilical tape is placed distal to the cancer, a liter or more of distilled water or of a 1:500 mercuric chloride solution is flushed through the isolated segment by the circulating nurse.

The second hazard is common to anterior resections of the rectum for any purpose: anastomotic dehiscence. Perhaps nothing known at present can reduce the 66 per cent incidence of minor leaks, even after resections by a master surgeon,<sup>14</sup> but precautions can surely minimize the chance of major disruptions. To free the anastomosis from all tension we advise mobilizing the splenic flexure at the outset of an operation in all patients except those with redundant descending and sigmoid segments of their colon. Division of the lateral attachments of the rectum later will sometimes result in a tumor 8 to 12 cm from the anus being freed enough to have both a 5 cm resection margin and the length of residual distal rectum necessary for continence. Mobilization of the entire tumor near the abdominal wall for ease in resection is the ideal to be sought,<sup>2</sup> but one that is infrequently realized in fat patients. Whether the anastomosis is done side-to-end or end-to-end is dictated by anatomic considerations and personal preference.

All rectal anastomoses should be loosely curving within the hollow of the sacrum. Nonetheless, dead space cannot be entirely avoided. Suction or sump drains should be inserted into the pelvis to remove serum and blood; these can be brought out either through the perineal skin or through the lower quadrants of the abdominal wall.<sup>4</sup> If the surgeon chooses to use Penrose drains instead, they must be brought out as far posteriorly as possible—perhaps even through the bed of the resected tip of the coccyx. The pelvis cannot be drained by Penrose tubing led upward



to the abdominal wall. Many of the problems associated with this operation would probably be eliminated by routinely allowing the small bowel to fill the pelvis all around, minimizing dead space and helping to seal the rectal anastomosis.<sup>22</sup>

## HARTMANN OPERATION

The two major technical problems of this operation are where to close the rectum and how to find it again if continuity is to be restored. Infections are half as common when the closure can be done above the peritoneal floor,<sup>13</sup> but, unfortunately, closure at this level is possible only for the minority of rectal cancers, especially if the objective is resection with a 5 cm margin in an attempt to cure. When the objective is palliation for a life expectancy so short that recurrence is unlikely, the ideal margin can be compromised in favor of the lesser morbidity of intraperitoneal closure. Drainage for extraperitoneal closures is described above.

At subsequent operations to restore integrity of the bowel, identification of the rectal stump is simplified if 5 cm long sutures of heavy silk have been placed at each end of the turn-in and fixed to the lateral peritoneal wall. These can be followed to the stump, which by then may be quite shrunken. Dissection below the pelvic floor is commonly necessary to free enough of the stump for safe anastomosis even if the original closure was intraperitoneal.

## RESULTS

Statistics on the overall curability of rectal cancer must be qualified, since many of them represent treatment of patients preselected for referral to a major medical center. Slaney's<sup>23</sup> analysis would seem to represent a balanced appraisal, since it deals with 5800 cases of rectal cancer reported to the Birmingham (U.K.) Regional Cancer Registry over 12 years from a population of nearly 5,000,000. The uncorrected 5-year survival rate was 22 per cent for all rectal carcinomas (29 per cent corrected for age), the cure rate of 3000 patients who could be treated with radical surgery (52 per cent resectability) was 40 per cent (49 per cent, corrected). Data from almost 12,000 cases of rectal carcinoma collected from many centers in this country showed similar survivals after surgical treatment, although the resectability rate was 75 per cent.<sup>4</sup> Granted that experts at certain referral centers will be able to remove more cancers than the variety of surgeons serving an entire region, the 96 per cent resectability of some individual series emphasizes the magnitude of possible preselection in them.

Patients with symptoms for a long time before they come to medical attention seem to survive longer than those with a short history of disease.<sup>3, 14, 24, 25</sup> Their cancers probably are less aggressively malignant, and the proportion of these less aggressive cancers in the population treated will also obviously weight the statistics of curability, as will the

proportion of women, who have longer survival after colonic cancer than men.<sup>26, 27, 31</sup> Among cancers of the same stage, if the blood vessels are invaded, the prognosis is worse.<sup>6</sup>

Overall, patients treated with radical surgery for a Dukes' stage A rectal cancer have an 80-to-98 per cent age corrected 5-year survival rate, for Dukes' stage B cancer 65-to-79 per cent survival, and for Dukes' stage C cancers 27-to-42 per cent survival.<sup>6, 9, 10, 18, 20, 26</sup> Radiation and fulguration of rectal cancers are unlikely to improve curability in disseminated cancer, although some evidence suggests that they may improve host resistance.<sup>7, 19, 28</sup> In localized cancers, it is not impossible that they could produce the same results as surgery with less morbidity.

## REFERENCES

- 1 Anonymous. Intestinal adhesions. *New Eng J Med*, 277 657-658, 1966
- 2 Butcher, H R, Jr: Carcinoma of the rectum choice between anterior resection and abdominal perineal resection of the rectum. *Cancer*, 28 204-207, 1971
- 3 Cole, W H. Cancer of the colon and rectum. *SURG CLIN N AMER*, 52 871-882, 1972
- 4 Collins, C D, and Talbot, C H. Pelvic drainage after anterior resection of the rectum. *Arch Surg*, 99 391-393, 1969
- 5 Copeland, F M, Miller, L D, and Jones, R S. Prognostic factors in carcinoma of the colon and rectum. *Amer J Surg*, 116 875-881, 1960
- 6 Corman, M L, Swinton, N W, O'Keefe, D D, et al. Colorectal carcinoma at the Lahey Clinic, 1962 to 1966. *Amer J Surg*, 125 424-428, 1973
- 7 Crile, G, Jr, and Turnbull, R B, Jr. The role of electrocoagulation in the treatment of carcinoma of the rectum. *Surg Gynec Obstet*, 135 391-396, 1972
- 8 Cutler, S J. Trends in cancers of the digestive tract. *Surgery*, 65 740-752, 1969
- 9 Donaldson, G A, and Welch, J P. Practical considerations in the management of cancer of the colon. *SURG CLIN N AMER*, 54 713-731, 1974
- 10 Dukes, C E. Discussion on major surgery in carcinoma of the rectum with or without colostomy. *Proc Roy Soc Med*, 50 1031-1035, 1957
- 11 Feller, I, and Woodburne, R T. Surgical anatomy of the abdominal aorta. *Ann Surg*, 154(2) 239-252, 1961
- 12 Frei, J V. Surgeon's audacity influences the outcome in carcinoma of colon and rectum. *Can J Surg*, 16 1-3, 1973
- 13 Goligher, J C. *Surgery of the Anus, Rectum and Colon*, 2nd ed. London, Baillière, Tindall & Cassell, 1967
- 14 Goligher, J C, Graham, N G, and de Dombal, F T. Anastomotic dehiscence after an-  
15  
16  
120 1031-1036, 1965
- 17 Lapides, J, and Tank, E S. Urinary complications following abdominal perineal resection. *Cancer*, 28 230-235, 1971
- 18 MacLeod, J H, Chipman, M L, Gordon, P C, et al. Survivorship following treatment for carcinoma of the colon and rectum. *Cancer*, 26 1225-1231, 1970
- 19 Madden, J L, and Kandalaft, S. Clinical evaluation of electrocoagulation in the treatment of cancer of the rectum. *Amer J Surg*, 122 347-352, 1971
- 20 Morgan, C N. Carcinoma of the rectum. *Ann Roy. Coll Surg Eng*, 36 73-97, 1965
- 21  
22  
23 Papaioannou, A N. Abdominoperineal resection of the rectum preliminary experience  
24  
25  
perineal resection for cancer of the rectum and rectosigmoid analysis of 524 cases. *Amer J Surg*, 123 110-117, 1971.

26. Slaney G. Results of treatment of carcinoma of the colon and rectum. In Irvine W (ed) *Modern Trends in Surgery*-3. London: Butterworths and Co., Ltd., 1971.
27. Stearns, M. W. Jr., and Schottenfeld D. Techniques for the surgical management of colon cancer. *Cancer*, 28: 165-169, 1971.
28. Suit H. Adenocarcinoma of colon and rectum: role of radiation therapy. *SurG CLIN N AMER*, 54: 733-740, 1974.
29. Turnbull, R. B. Jr., and Weakley F. L. *Atlas of Intestinal Stomas*. St. Louis, C. V. Mosby Company, 1967.
30. Vandertoll D. J. and Beahrs O. H. Carcinoma of rectum and low sigmoid (Discussion by Carroll). *Arch Surg*, 90: 793-798, 1965.
31. Welch C. E. and Burke J. F. Carcinoma of the colon and rectum. *N Eng J Med*, 266: 211-219, 1962.
32. Zollinger R. M., and Sheppard M. H. Carcinoma of the rectum and the rectosigmoid. A review of 729 cases. *Arch Surg*, 102: 335-338, 1971.

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*Research in physiology in aviation medicine*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

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COVER PHOTOGRAPH

—Official United States Navy Photograph.

*Research in physiology in aviation medicine*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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*Director, Medical Services,*  
*Department of Defense.*

RAYMOND W. BLISS,  
*Major General, U. S. A.,*  
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*Any reference in an article of this publication to a proprietary drug or its chemical formula shall not constitute an endorsement of its efficacy or use in the treatment of any disease.*

UNITED STATES  
GOVERNMENT PRINTING OFFICE  
WASHINGTON 1950

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Subscriptions should be sent to the Superintendent of Documents, United States Government Printing Office, Washington 25, D. C.

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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY THE DIRECTOR OF THE BUREAU OF THE BUDGET, OCTOBER 19, 1949

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## Malignancies of the Colon<sup>1</sup>

### A Discussion of Some Problems

ISIDOR S. RAVDIN, *B.S., M.D.*<sup>2</sup>

IN THE field of intestinal surgery even competent surgeons are not agreed on the solution of a number of problems among which are the following: what constitutes operability; should a radical operation be performed in the presence of major metastasis; what are the advantages of a one-stage over a two-stage operation; aseptic versus open anastomosis; or various modifications of the Mikulicz operation versus end-to-end or end-to-side anastomosis. The well-known caution of our profession has led us frequently to continue concepts and procedures which in the light of modern evidence are outmoded, or, if one searches carefully for the truth, not in the best interests of the patient. The answer to many of these problems is not to be found in statistical analysis alone, for operability varies with the skill and boldness of the surgeon, method often varies with training and expe-

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<sup>1</sup> Presented at the Monthly Medical Meeting, Army Medical Center, Washington, D. C., on 15 December 1949.

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rience, and both may depend on a consideration of the immediate mortality and not on the more remote factor of end results. The operative treatment of lesions of the colon presents the surgeon with a multitude of difficult problems in diagnosis, in judgment, in pre- and post-operative care, and in technique.

The diagnosis of large bowel malignancy should not be difficult and yet more than 50 percent of our patients come to us with metastasis to abdominal lymph nodes or to the liver. More than 50 percent of the cancers of the large bowel including the rectum are within reach of the finger, the proctoscope, or the sigmoidoscope. Medical students spend endless time looking into the nose, mouth, pharynx, and the external auditory meatus, as part of a so-called complete examination of the patient, while the examination of the rectum is neglected. Few of our medical schools insist on the students learning the technique of proctoscopic and sigmoidoscopic examination. A change in bowel habits, a grave and unexplained anemia, continuing colic, the presence of blood in the stools, all call for a careful examination of the abdomen, proctoscopic and sigmoidoscopic examination, and a careful radiographic study of the large bowel above the rectosigmoid with barium enema regardless of the age of the patient.

A cancer of the cecum, ascending colon, and often of the hepatic flexure is apt to be a moderately large tumor extending into the lumen of the bowel. Only rarely is it an annular scirrhous lesion. This portion of the bowel has a larger diameter, and the fecal content is liquid or quite soft and, therefore, acute intestinal obstruction is rare. Anemia, on the other hand, is frequent and may be so severe as to simulate a primary anemia. It results in part from blood loss from the surface of the tumor and perhaps in part from blood destruction, but the cause of the latter is not now known.

In the transverse colon the fecal stream becomes firmer, the lumen of the bowel is smaller and the tumor tends to become annular. Constipation and colic will be found in a high percent of the patients with malignant lesions in this area.

In the splenic flexure one of the most common features of cancer is the frequency with which perforation and a left subphrenic abscess occur. As one follows the lesions to the rectosigmoid, they become even more annular and scirrhous. The fecal stream becomes more solid and obstruction occurs with increasing frequency. Even in the absence of acute obstruction one often finds considerable distention of the bowel proximal to the lesion, and the presenting symptoms are so frequently associated with massive cecal distention as to suggest a lesion in the right lower abdominal quadrant.

In the rectum one finds a variety of lesions, some sessile, some excavating, others polypoid; the presenting symptoms may vary with

the type of lesion that is present. There are, of course, variations from these pathologic characteristics, such as when cancer is engrafted on a single polyp of the colon or occurs in one or more areas of polyposis.

In the past year and a half we have operated on 14 patients with more than 1 primary malignant lesion of the large bowel. In every instance these lesions have been engrafted on preexisting adenomatous polyps.

At least two types of colonic polyposis occur; one is associated with prolonged infection of the colon, and the other is a congenital lesion. The first is pathologically and significantly different from the second. The polyps, which have their origin in a bowel that is the site of chronic colitis or recurring dysentery, are myxomatous in character and are like the polyps so frequently seen in association with long-standing maxillary sinusitis.

The adenomatous polyp is a true tumor. It is frequently seen in several members of the same family. It may be found in children if careful studies are made. I have within the past year, removed a large adenomatous polyp from a child 3 years of age. The adenomatous polyp must be looked on as a potentially serious lesion for 50 percent or more of patients with generalized adenomatous polyposis will have malignant lesions before the fortieth year and nearly 100 percent by the age of 65.

If there is a hereditary precancerous lesion it is congenital adenomatous polyposis. This lesion accounts for nearly 100 percent of the instances of familial cancer of the large bowel. Every officer and enlisted man inducted into the Armed Forces should be questioned as to the cause of death of members of his family. If colonic cancer has been a cause of death, a careful study should be made for the presence of adenomatous polyps.

Cancer occurs much less frequently in the large bowel that is the site of the polyposis associated with chronic infection. Dennis has reported the presence of cancer in 12 percent of the colons he has resected for chronic ulcerative colitis. The cancer in these instances is not, however, engrafted on the polyposis.

It has been stated that resection of the colon down to the sigmoid, and fulguration of the remaining polyps in the sigmoid and rectum, if they are not too numerous, followed finally by an ileosigmoidostomy is a satisfactory procedure for adenomatous polyposis. It may well be when the polyps in the rectum and sigmoid are few in number and when the patient can be kept under constant surveillance. The following case report illustrates what can happen when too conservative measures are used, and emphasizes the responsibility of the



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patient can be corrected by the administration of a high carbohydrate, high protein, diet containing a moderate amount of fat. There is no need to eliminate fat from the diet of these patients. If 25 percent or more of the total calories are derived from protein, fatty infiltration of the liver does not occur. The fat will provide twice the number of calories, gram for gram, as will carbohydrate or protein. The diet should, we believe, always be a low-residue diet in order to facilitate the ultimate aim of a clean bowel. It should provide 3,000 to 3,500 calories per day.

The vitamin intake should be ample not only for the usual vitamin requirements but also for complete physiologic requirements since vitamin synthesis from intestinal bacteria may be seriously impeded once oral chemotherapy or antibiotic therapy is begun. We must be more alert to the serious nutritional changes that may take place when effective intestinal bacterial growth is greatly retarded. Not only may prothrombin synthesis be effected, but amino acid utilization becomes impaired when, as the result of intestinal bacterial decimation, riboflavin and other vitamins are no longer synthesized in adequate amounts. The amounts of the various vitamins that we consider necessary for oral ingestion are greatly supplemented by intestinal bacterial synthesis to meet our physiologic requirements, and the amounts synthesized within the bowel may be in excess of those ordinarily ingested.

Dependence for the correction of the anemia should not be placed on diet and iron but on multiple transfusions. When anemia and a protein deficiency coexist, the protein ingested above that required for energy will go first to the synthesis of hemoglobin and not to replace the depleted stores of body and plasma protein. In the severe anemias so frequently observed in patients with cancer of the cecum and ascending colon, it may not be possible to correct the anemia completely prior to resection. In such patients rapid restoration of the necessary blood following operation is a very useful procedure, but the restoration of plasma volume and blood mass by transfusions prior to operation make them better operative risks.

Chemotherapy is begun as soon as the patient is admitted to the hospital and the diagnosis established. Succinylsulfathiazole is as effective an agent as is now available for the initial therapy. Our patients receive 4 to 6 gm. of this drug every 6 hours by mouth, for 5 to 7 days. In the last 3 days of preoperative preparation, 0.25 gm. of streptomycin is given orally every 6 hours. With this combination effective bacterial control is obtained and bacterial resistance to these agents is not frequently encountered. There is no doubt in our minds that streptomycin has a wider antibacterial spectrum than does any other agent now available. Its use after 4 or 5 days may be followed by a specific resistance of certain organisms and it is for this reason

surgeon to perform the most radical operation possible if any operation is to be performed.

### CASE REPORT

The patient, a 23-year-old woman, had widespread colonic polyposis of the adenomatous type. One grandfather, one uncle, and her father had died of intestinal malignancy, presumably engrafted on colonic polyposis. Her intense desire to save her rectum had led an able surgeon to perform a colectomy to just above the rectosigmoid and later to perform an ileoproctostomy. The polyps remaining in her rectum were fulgurized. There was no follow-up after the first year when she was pronounced "out of danger," and yet 2 years later I saw her with wide-spread rectal cancer and hepatic metastasis. She died about 13 months later.

I have seen other instances of this type, which fortify my conviction that only a complete operation should be performed and that no operation is complete without resection of the entire polypoid area unless the patient can be kept under frequent observation.

Only a small percent of the total number of patients with cancer of the colon treated in any clinic are admitted with acute obstruction. These require an emergency operation. The nonobstructed patients are greatly benefited by a period of from 7 to 10 days of careful preoperative preparation. This is true whether the lesion is in the right or left half of the colon. It should be dispensed with only when the contemplated operation is to be a proximal colostomy.

The majority of these patients are malnourished in varying degrees. Many more are anemic. Loss of sleep from pain, a debilitating diarrhea, and abdominal distention, together with anemia and hypoproteinemia, combine to make the patient a poor operative risk unless a carefully designed preoperative program is initiated which will lead to improvement in nutrition and anemia, to better circulation, and to a reduction in the bacterial count of the intestinal contents. Such a program will permit more radical operations to be performed in one stage, with a lessened incidence of postoperative peritonitis, serious wound infections, and wound dehiscence. It will tend to reduce the incidence of exaggerated edema at the sites of resection and anastomosis. Edema at such a site follows all such operations, but it is intensified when the biologic mechanism for returning fluids to blood vessels is disturbed. The control of this is of real importance when resection and immediate suture is contemplated, for the brawny edema that follows trauma in the hypoproteinemic patient may, for some days, prevent the normal functioning of an otherwise perfect end-to-end anastomosis and may result in leakage at the site of suture from faulty wound healing.

In the absence of definite obstruction the patient should be fed by mouth while the bowel is being prepared and the condition of the patient is being improved. Deficiencies in the nutritional state of the

patient can be corrected by the administration of a high carbohydrate, high protein, diet containing a moderate amount of fat. There is no need to eliminate fat from the diet of these patients. If 25 percent or more of the total calories are derived from protein, fatty infiltration of the liver does not occur. The fat will provide twice the number of calories, gram for gram, as will carbohydrate or protein. The diet should, we believe, always be a low-residue diet in order to facilitate the ultimate aim of a clean bowel. It should provide 3,000 to 3,500 calories per day.

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that the combined therapy has received wider use. The use of effective bacteriostatic and bacteriocidal agents by mouth before operation, the parenteral administration of penicillin and streptomycin in the postoperative period, together with an improved nutritional state that will permit the mobilization of a normal biologic defense mechanism, are all adjuvants to sound surgery. The result is a distinct reduction in morbidity and mortality in patients requiring colonic resection.

Of even greater importance is the fact that we have been able to change from modifications of the Mikulicz procedure to the more desirable resection and direct anastomosis. No attempt is made to perform an entirely aseptic anastomosis. We agree with Karl Meyer that if the patient is properly prepared, open anastomosis is a safe procedure.

In 1940, William Oler Abbott and I reported on the use of the Miller-Abbott tube as a means of facilitating a one-stage resection and anastomosis of the right colon. The use of this method has since been favorably reported on by Whipple and by Newton and Blodgett. When the tube has been successfully passed into the lower ileum or the right colon, the bowel is relieved of distention and normal peristalsis is reestablished; although a completely clean bowel is not obtained, the fecal content is minimal.

The tube is passed 48 hours before the contemplated operation, and its position is checked at intervals by fluoroscopic study. Feeding and chemotherapy are continued during this period. If a right colectomy is performed, the tube is kept in the ileum about 18 inches from the site of the end-to-side anastomosis. If resection of the distal colon is carried out, the tube is left in the proximal colon if it has passed the ileocecal valve. The Miller-Abbott tube remains in the bowel until the patient's intestinal functions have returned to normal, usually the fourth to sixth day after operation. Once peristalsis is reestablished and gas and feces are passed by colostomy or by rectum, it is safe to remove it.

It must be emphasized that the use of the Miller-Abbott tube does not obviate the necessity of a colostomy in cancer of the bowel associated with acute or even with severe chronic obstruction, but even in many of these patients it reduces ileus, adds greatly to the comfort of the patient and to the effectiveness of the colostomy.

In Whipple's series the mortality of resections of the large bowel prior to the use of the tube was 18.2 percent and subsequent to it 2.8 percent. In Newton and Blodgett's series and in our own the use of the tube and chemotherapy were begun at about the same time. The former authors report a reduction in serious infections from 43 to 6 percent when only patients having resection and anastomosis were compared. There was a gross reduction in complications of from

58 to 25 percent and a general reduction in mortality from 22 to 3 percent. Our data are in accord with those just reported, the mortality having been reduced from 18.4 percent prior to chemotherapy and suction to 3.4 percent since.

There has been much difference of opinion as to what operation should be performed in the presence of acute obstruction—a cecostomy or a colostomy proximal to the point of obstruction? In our opinion there is no choice. It is a fortunate circumstance that acute obstruction occurs, nearly always, distal to the hepatic flexure, for this permits the performance of a colostomy, which will later assure a safer radical operation.

A cecostomy provides neither an empty nor a clean bowel. It is necessary to divert the fecal stream completely to obtain this. Fecal soiling can rarely be prevented at the time of radical resection if dependence has been placed on a cecostomy. Fallis has recently stated:

The uncertainties of appendicostomy and the hazards of cecostomy can be circumvented by utilizing the transverse colon as the site for decompression. Moreover, colostomy in the transverse colon produces not only decompression, but defunctionalization as well. The transverse colon is well suited for the performance of colostomy since it is the most mobile, the narrowest, and the least distensible portion of the colon. Furthermore, if the right half is used, the colostomy is then located well away from any incisions planned for operative procedure on the left colon. Left subcostal, left rectus, transverse at the umbilicus, and the Cherney modification of the Pfannenstiel incisions can all be planned and executed through uncontaminated areas.

I find myself in complete agreement with this statement.

There is no unanimity regarding the general types of operations which should be used in attempting radical resection of the colon for cancer. The truth is that no one operation should be used in all instances and that the surgeon who uses only a single procedure fails to provide the maximum benefit to his patients. There can be no doubt that indications exist for modifications of the Mikulicz operation, but they are becoming rarer with each succeeding year. There has been, however, a sufficient critical experience for one to venture certain generalizations in regard to operative procedures.

The operation should be one which will provide for radical removal of the diseased bowel and maximal excision of the lymph nodes which act as receptacles for the lymphatic vessels from the involved area. No operation can be considered too big and Lahey's dictum of "a large operation for a small tumor" must constantly be followed. The one-stage operation should be performed in every instance when this is possible and when the patient is adequately protected. Two operations subject the patient to the double risk of anesthesia and operation and to prolongation of convalescence. All too frequently trauma at the first operation encourages metastasis and even if it does not, a tumor

that the combined therapy has received wider use. The use of effective bacteriostatic and bacteriocidal agents by mouth before operation, the parenteral administration of penicillin and streptomycin in the postoperative period, together with an improved nutritional state that will permit the mobilization of a normal biologic defense mechanism, are all adjuvants to sound surgery. The result is a distinct reduction in morbidity and mortality in patients requiring colonic resection.

Of even greater importance is the fact that we have been able to change from modifications of the Mikulicz procedure to the more desirable resection and direct anastomosis. No attempt is made to perform an entirely aseptic anastomosis. We agree with Karl Meyer that if the patient is properly prepared, open anastomosis is a safe procedure.

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not resectable at the first operation in the absence of obstruction is not resectable later.

Regional lymph node involvement is not a positive indication of metastasis, for, in the ulcerating lesions, secondary infection is common, and many of the nodes on micro-copic study show only the hyperplasia of chronic infection. Nor should the size of the lymph nodes deter the surgeon from proceeding with a radical resection. Large lymph nodes often merely show inflammation while small ones may be completely filled with neoplastic cells. The resection of small portions of the bowel and even smaller areas of the mesentery will be followed by a higher incidence of early and late metastases than if wide areas of the bowel and mesentery are resected at the first operation. The ideal condition for resection is a clean and empty bowel. This cannot always be attained, and certain advances in preoperative preparation may make it less necessary. It is an ideal to strive for regardless of the type of operation to be performed, and the more nearly it is attained the less risk the operation will entail.

The blood supply of the large bowel is not as free as that of the small bowel, and it is more easily impaired by poorly placed sutures, by too many sutures, and by lack of attention to the vessels supplying a particular segment of the bowel. The wall of the colon is thinner than that of the small bowel except in the rectum, and large portions of it are not so completely surrounded by peritoneum. Complete serosal approximation is, therefore, not always attainable.

Resectability should not be determined with one eye on the immediate mortality. A high resection rate will be followed by a larger number of 5-year cures, but a high total early mortality. The higher the resection rate the larger will be the number of 5-year cures regardless of the immediate mortality. The latter is of no special significance for all patients will be dead in 5 years if nothing is done. If wide areas of the bowel containing the tumor, the contiguous mesentery, and the adjacent lymph node-bearing area can be resected, radical operation should always be attempted.

One must not be deterred by the magnitude of the operation or at times even by distant metastasis. A patient with a resectable lesion of the lower bowel with metastasis to the liver will live his final period of life in greater comfort than he will if the lesion is left behind to involve the bladder and the regional nerve supply. Even if the patient eventually dies from metastasis, so do many of our patients in whom no distant spread is found at the primary operation. A more enlightened viewpoint on resection of parenchymal metastasis is now opening a new era in the surgery of malignant disease.

In lesions of the cecum, ascending colon, and hepatic flexure a one-stage operation is performed, resecting the terminal ileum and right colon. Intestinal continuity is restored by an end-to-side or end-to-

end anastomosis—ileum to transverse colon. In lesions of the transverse colon resection and end-to-end anastomosis is to be preferred to any modification of the Mikulicz operation. In certain of these lesions a preliminary cecostomy may be entirely proper. In lesions of the splenic flexure and descending colon direct anastomosis again is preferable as it is in the proximal sigmoid. In the aged and in those with extensive collateral disease a Rankin obstruction resection is often indicated, but even in these patients, as our experience has become greater, we have come to prefer end-to-end anastomosis.

In the low sigmoid, rectosigmoid, and lesions of the ampulla of the rectum, resection and end-to-end suture have been advocated by Babcock and Bacon, Wangenstein, and Waugh and Custer. The studies by Glover and Waugh on the spread of cancer from this portion of the bowel show that retrograde metastasis to the lower perirectal lymph nodes rarely occurs. Their investigations would seem to provide the necessary evidence that the operation of proctosigmoidectomy is at times justifiable. I do not believe, however, that it is possible to perform the wide dissection of the pelvic floor and perirectal tissues when proctosigmoidectomy is contemplated, which is possible when a complete abdominoperineal operation in the Miles tradition is carried out.

If in each instance the surgeon considers that his final responsibility to the patient and to society is the highest possible percent of 5-year cures, he will think less and less of catering to the immediate whims of the distraught patient, who believes that an abdominal anus will make life intolerable. The one-stage abdominoperineal resection for rectosigmoid and rectal lesions is still the operation of choice for the majority of surgeons. With no other procedure can 50 or more lymph nodes be removed with the lesion—nodes which may already be the seat of metastasis and which provide the pool for further spread subsequent to operation.

We must do everything possible to diagnose these lesions earlier; to increase operability; to make our resections more extensive; to think less of saving the rectum and more of curing the patient. More extensive resections are possible in better prepared patients. The incidence of infection subsequent to resection and anastomosis has been materially reduced by adjuvants to operative therapy. We must think less and less of the immediate operative mortality and more of 5-year and longer cures. Few fields of the surgery of malignant disease give such hope for the future as does this one. Ours is a great responsibility.



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# Malignant Neoplasms of the Skin

ROBERT E. OKER JR. *Lieutenant Commander (MC) U S N*<sup>1</sup>

COMPARISONS of the incidence of diseases in the Navy and in the civilian population must always be made with caution. Among the reasons for this are (a) the differences in population structure—the Navy being made up largely of healthy young white men and (b) the differences in the completeness of reporting of disease incidence. In nonreportable diseases, estimates of incidence among civilians can usually be made only from death rates. Such estimates are often likely to go far afield.

In 1937 Peller and Stephenson (1), using death rates among civilians, concluded that the incidence of skin cancer in the Navy was eight times that of comparable civilian groups. On the assumption that Navy men were exposed to sunlight to an abnormal degree, a causal relationship between the two was postulated. This has been widely cited (2) (3) in support of the idea that exposure to sunlight plays a large part in the causation of skin cancer.

There has been a growing interest in malignant disease as a public health problem since the work of Peller and Stephenson, and figures on the incidence of neoplasms for selected civilian groups are now available. This makes it possible to make more direct comparisons between Navy personnel and civilian populations. Among the most reliable information available for large civilian groups is that based on the National Health Survey conducted from 1937 to 1939 and published by Dorn (4). These figures have been used to determine the difference, if any, between Navy and civilian experience with malignant neoplasms of the skin.

## PROCEDURE

The incidence rates for skin cancer per 100,000 population by 5-year age groups for men in the United States as a whole, given by Dorn, were applied by ages to the average strength of the Navy and Marine Corps for the years 1946 and 1947 combined. The sum of these products is the number of cases that would be expected to occur in the Navy if the rates for men in the country at large were operating in the Navy. An idea of the difference in experience between the two groups may be obtained by comparing this expected number with

<sup>1</sup>Medical Statistics Division, Bureau of Medicine and Surgery, Department of the Navy

the actual number of cases occurring in the Navy during those years. This same procedure was also followed for malignant neoplasms of all sites. The ages considered were confined to the 5-year groups between 20 and 60 because this was the only area in which comparability of age-grouping could be obtained. It is believed that differences at the two ends of the age scale would be insufficient to make much of a change in the results. The rates for the younger ages are very low, and the Navy population over age 60 is very small.

## DISCUSSION

The reported and the expected incidence for malignant tumors of the skin in the entire Navy and Marine Corps for the years 1946 and 1947 combined are shown in table 1, and for malignant tumors of all sites in table 2. For skin tumors, the reported incidence of 157 cases is approximately twice the 77 cases which would have been expected if the rates for men in the United States in general had been effective in the Navy. This is in contrast to the eightfold difference estimated from the earlier data. In neoplasms of all sites the difference is almost as great; the reported incidence of 707 is 1.75 times the expected 400 cases.

TABLE 1—*Malignant neoplasms of the skin, reported incidence and expected incidence—Navy and Marine Corps, 1946-47*

Age	Average strength, Navy and Marine Corps			
20 to 24 years.....	405,595	3 4	27 6	40
25 to 29 years.....	131,057	5 2	17 9	26
30 to 34 years.....	56,825	8 9	10 1	27
35 to 39 years.....	29,516	11 0	6 5	19
40 to 44 years.....	14,151	22 6	6 4	14
45 to 49 years.....	7,998	34 4	5 5	15
50 to 54 years.....	3,400	63 1	4 3	8
55 to 59 years.....	1,302	96 2	2 5	8
Total .....	652,844		76 8	157

<sup>1</sup> See reference (4)

TABLE 2—*Malignant neoplasms, all sites, reported incidence and expected incidence—Navy and Marine Corps, 1946-47*

Age	Average strength, Navy and Marine Corps	Incidence rate per 100,000 men, United States <sup>1</sup>	Expected cases, Navy and Marine Corps	Reported cases, Navy and Marine Corps
20 to 24 years.....	405,595	16 2	131 4	259
25 to 29 years.....	131,057	27 9	71 8	141
30 to 34 years.....	56,825	42 5	48 3	84
35 to 39 years.....	29,516	60 4	35 7	65
40 to 44 years.....	14,151	126 4	35 8	47
45 to 49 years.....	7,998	213 9	31 2	54
50 to 54 years.....	3,400	367 8	25 0	37
55 to 59 years.....	1,302	581 5	15 1	17
Total .....	652,844		400 3	707

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the actual number of cases occurring in the Navy during those years. This same procedure was also followed for malignant neoplasms of all sites. The ages considered were confined to the 5-year groups between 20 and 60 because this was the only area in which comparability of age-grouping could be obtained. It is believed that differences at the two ends of the age scale would be insufficient to make much of a change in the results. The rates for the younger ages are very low, and the Navy population over age 60 is very small.

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Age	Average strength, Navy and Marine Corps	Incidence rate per 100 000 men, United States <sup>1</sup>	Expected cases, Navy and Marine Corps	Reported cases, Navy and Marine Corps
20 to 24 years.....	405,595	3.4	27.6	40
25 to 29 years.....	134,057	5.2	13.9	26
30 to 34 years.....	56,825	8.9	10.1	27
35 to 39 years.....	29,516	11.0	6.5	19
40 to 44 years.....	14,151	22.6	6.4	14
45 to 49 years.....	7,998	34.4	5.5	15
50 to 54 years.....	3,400	63.1	4.3	8
55 to 59 years.....	1,302	96.2	2.5	8
Total .....	652,844	—	76.8	157

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TABLE 2—*Malignant neoplasms, all sites reported incidence and expected incidence—Navy and Marine Corps, 1946-47*

Age	Average strength, Navy and Marine Corps	Incidence rate per 100 000 men, United States <sup>1</sup>	Expected cases, Navy and Marine Corps	Reported cases, Navy and Marine Corps
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25 to 29 years.....	134,057	27.9	74.8	141
30 to 34 years.....	56,825	42.5	44.3	64
35 to 39 years.....	29,516	60.4	35.7	63
40 to 44 years.....	14,151	126.4	35.8	47
45 to 49 years.....	7,998	213.9	31.2	54
50 to 54 years.....	3,400	367.4	25.0	37
55 to 59 years.....	1,302	584.5	15.1	17
Total .....	652,844	—	400.3	707

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The figures shown here cannot, for various reasons, be interpreted as showing the absolute relationship between the incidence of malignant tumors in the general population and in the Navy. The populations and periods of time involved are not completely comparable. Furthermore the Navy figures are the result of cases reported routinely while the civilian figures are based on a single survey. For these reasons, no attempt has been made to compute rates for the two groups for purposes of comparison. However, it is believed that the information examined is sufficient to support the conclusion that the incidence of skin cancer in the Navy is very little, if any, higher than in civilian groups of comparable age and sex.

There are numerous reasons which seem adequate to explain the apparent incidence of malignant growths to be greater for Navy personnel than for civilian groups, when actually this is not true. The men are subjected to regular physical examinations at frequent intervals. Complete medical care, including facilities for the microscopic examination of tissue, is readily available at no expense. Therefore, it is likely that the percentage of undiagnosed cases in the Navy is very low, while in general population it is known to be fairly high. Further, with rare exceptions, every diagnosed case in the Navy is reported. And, finally, if any bias is introduced by the difference in time of some 8 or 9 years between the Navy and civilian figures, that bias would work to make the Navy figure higher since there is evidence that the incidence of malignant tumors is increasing in the general population.

For these reasons it may be concluded that the apparent high incidence of malignant tumors in the Navy does not reflect the true state of affairs. In fact, there is no reason to believe that naval personnel develop tumors with greater frequency than similar persons in other occupations. The reported incidence of skin cancer in the Navy exceeds the expected incidence in about the same ratio as the Navy experience with malignant neoplasms of all sites exceeds that expected from civilian rates. This fact sustains the conclusions that more complete reporting and not environmental influences result in higher incidence of skin malignancy in the Navy.

#### REFERENCES

1. TELLER, S., and STEPHENSON, C. S. Skin irritation and cancer in the U. S. Navy. *Am J M Sc* 194; 329-333, Sept 1937.
2. BLUM, H. F. Sunlight and cancer of the skin. *J Nat Cancer Inst* 1: 397-421, Dec 1940.
3. ABWAGER, V. Sunlight is less important than you think. *Hygeia* 26: 548, Aug 1948.
4. BLUM, H. F. Illness from cancer in the United States. *Pub Health Rep.* 59: 33-48, Jan 1944.



# Carcinoma of Lung

## Report of a Case Simulating Pleural Mesothelioma

LESTER W. FIX, *Lieutenant (MC) U. S. N.*<sup>1</sup>

SINCE the diagnosis of mesothelioma as a primary neoplastic lesion was first suggested (1) it has not been generally accepted and repeated reports have appeared (2) (3) (4) criticizing such a disease entity. The early literature presents too sketchy an account of both gross and histologic pathologic changes upon which to establish the diagnosis of mesothelioma. Geschickter (5) presented some interesting cases but Willis (2) failed to accept any of these as proved cases. Likewise many other authors (2) (3) (4) accepted only rare cases proved beyond question of doubt. Castleman (6) accepted one case and stated that this was the first case in which he believed there was actually such a tumor as a mesothelioma. Many other authors have presented single and multiple cases (7) (8) (9) (10) of supposed mesothelioma but critical analysis finds most of them lacking conclusive evidence on which to base the diagnosis. Indeed many of them prove to be a tumor other than mesothelioma. Certainly cases without autopsy protocol cannot be accepted as mesothelioma; these are either carcinomas of the lung or metastatic prostatic carcinomas. Because of this failure of general recognition, a case (seen at the U. S. Naval Hospital, Great Lakes, Ill.) is presented which demonstrated (a) the cellular structure sometimes described as typical of mesothelioma, (b) a clinical picture suggestive of mesothelioma, and (c) gross autopsy findings somewhat characteristic of mesothelioma, but conclusive microscopic evidence of the diagnosis of carcinoma of the lung.

### CASE REPORT

*History*—A 19-year-old white man, not appearing acutely ill, fairly well-developed and well-nourished was admitted with the chief complaint of pain in the right chest posteriorly and slight chronic cough for almost 1 year. The past history was noncontributory except for a fractured fifth rib, 1 year previously; this fracture was not located near the site of the present complaint. Physical examination revealed normal temperature, respirations, and blood pressure. The pulse rate was 128. Dullness and decreased breath sounds were present over the

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Figure 1.



Figure 2.

right posterior thoracic region. Roentgenograms taken in May 1948 (while in civilian status) showed a peripheral thoracic shadow (fig. 1). Roentgenogram (Navy) in January 1949 showed a mass in the right posterior superior thoracic cavity extending from the fourth to the seventh rib and measuring  $12 \times 6\frac{1}{2}$  cm (fig. 2). There was some erosion of the fourth and fifth ribs. Laboratory examinations showed complete blood counts, urinalysis, Kahn test, Bence Jones protein, and albumin globulin ratio, all within normal limits. The sedimentation rate was elevated.

*Course*—An exploratory thoracotomy was done and a sheet of tumor investing the right upper posterior lung was found.



Figure 3.

The pleura was considerably thickened in the area of the fourth and fifth ribs by tumor which had eroded these ribs. Surgical extirpation was impossible because of extension over the lung surface. A specimen for biopsy was taken and the surgical site was closed. The biopsy showed neoplastic tissue compatible with a mesothelioma and was identical with the lung tumor described later in the pathological report. The slides were reviewed by numerous experienced consultants who, for the most part, concurred with this impression. The patient's immediate postoperative course was stormy. High-voltage roentgen therapy was given and the patient improved enough to go on convalescent leave. Study of the roentgenograms when he returned showed a decrease in the size of the mass (fig. 3). The consensus was that this was a mesothelioma of the pleura although there was not

complete accord in this diagnosis. The patient's course was progressively downhill and 12 February 1949, 5 months after his original admission to the hospital, he suddenly died.

### *Pathological report*

*General description.*—The body is that of a thin, emaciated white man measuring 5 feet 2 inches and weighing approximately 90 pounds. There is a distinct discoloration of the right thorax.

*Cranial cavity.*—The brain weighs 1,640 gm. In the left frontal area there is a 5 cm. fairly well delineated, deep reddish-purple mass replacing most of the brain tissue. This mass is completely surrounded by a yellow, firm capsule of cerebral tissue. The mass shells out of the lumen with ease. In the left cerebellum there is a lesion 2 cm in diameter, composed of soft white tissue. This tumor tissue is similar to that seen in the left lung. The fourth ventricle is noticeably dilated.

*Thoracic cavity.*—The bony cage presents a large mass which is firm and, in some areas, calcified, involving the third, fourth, fifth, and sixth ribs about 2 cm from the vertebral origin. This tumor has resulted in some destruction of the fourth and fifth ribs. The mass extends into the pleural cavity and is firmly adherent to and infiltrating into the right lung. There is no free fluid in the left pleural cavity. The pleural cavity on the right is obliterated by tumorous adhesions. The pericardium is normal.

*Lungs.*—A thin neoplastic sheet covers almost the entire surface of the right lung. The lung is shrunken, firm, and almost completely nonaerated. In the outer margin, continuous with the mass previously described (see thoracic cavity), is a large soft white mass of neoplastic tissue. Cut sections of the lung show a homogeneous reddish-pink, firm fibrous pulmonary parenchyma. There is a sharp line of demarcation between the tumor and the pulmonary parenchyma. The left lung is mottled and grayish-purple. The cut sections reveal diffuse hemorrhage throughout the entire pulmonary parenchyma on this side. Undoubtedly there was rupture of some small vessel into a bronchiole resulting in massive intrapulmonary hemorrhage. The trachea is essentially normal. The right bronchus is essentially normal. On gross dissection there is no tumor within the major or minor bronchioles. The left bronchus, from the primary bronchus to the alveoli, is filled with recent fluid hemorrhage. The mediastinal lymph nodes are relatively normal in size but some of them are replaced by tumor. Dissection of the bronchi, bronchioles, and smaller ramifications of the bronchial tree fail to reveal any neoplasm.

### *Microscopic description of major organs*

*Lungs.*—Sections through the lungs, underlying the neoplastic tissue described in the gross examination, show neoplastic tissue involving visceral pleura but sharply demarcated from the pulmonary parenchyma. Beneath this neoplastic tissue the pulmonary tissue shows considerable atelectasis with some dilation and congestion of the vessels. There are large numbers of pigment-filled macrophages scattered throughout the collapsed alveolar lumina. There is no evidence of invasion or infiltration of the neoplastic tissue beyond the visceral pleura of the lungs. The visceral pleura is extremely thickened and replaced in most areas by neoplastic tissue. This neoplastic tissue is composed of medium-sized polyhedral cells. These cells have large vesicular nuclei which are quite variable in shape. Many of the nuclei have multiple nucleoli which are likewise bizarre in shape. Mitotic figures are fairly frequent. The cyto-



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plasm of these cells is fairly abundant and eosinophilic (fig 4). Occasional papillary arrangement on a fine fibrous stroma is seen. The microscopic picture is identical with that seen in certain cases of primary hilar broncho-epithelioma. Study of many additional sections through the junction of the tumor mass in the underlying lung reveal a sharp line of demarcation between the pulmonary parenchyma and the visceral pleura with no tumor invading or infiltrating the pulmonary parenchyma. Multiple sections of the lungs reveal diffuse hemorrhagic infiltration throughout the alveolar lumina. The blood vessels are greatly dilated and congested. There is some fibrosis of the interstitial tissue in the right middle lobe. The bronchi and bronchioles are filled with red blood cells. Repeated sections of lung finally resulted in the demonstration of histologic area of neoplastic tissue identical with the main pleural mass and with the metastatic lesions. This lesion was a 2 mm.-in-diameter area of neoplastic tissue almost completely filling the lumina of a tiny bronchiole. The neoplastic tissue is continuous with essentially normal bronchial epithelium in one area (fig 5). Except for this microscopic lesion there is no other evidence of tumor in the lung.



Figure 4



Figure 5

**Adrenal**—In the adrenal there is a well-delineated mass of neoplastic tissue identical with that found in the lung.

**Bone marrow**—Sections show bony spicules which are fairly well preserved. In some areas, scattered throughout the bone marrow, there are small islets of neoplastic tissue composed of cells the same as those found in the lung.

**Lymph nodes**—Sections through the mediastinal lymph nodes reveal neoplastic tissue replacing the lymph nodes. The cells in this neoplastic tissue are identical with those previously described.

**Brain**—Sections of the neoplastic lesion described in the brain reveal tumor identical with that in the lung. The adjacent cranial tissue is compressed but not invaded by the neoplastic tissue. The brain elsewhere shows some leuromedema.

*Diagnoses.*—The final anatomical diagnoses were: (a) subpleural primary carcinoma of right lung; (b) extensive pleural metastases with carcinomatous obliteration of the pleural cavity (simulating mesothelioma); (c) carcinoma metastases to mediastinal lymph nodes, adrenal, bone marrow, and brain; and (d) pulmonary hemorrhage in the left lung.

#### DISCUSSION

If this case was mesothelioma it presents the problem of whether mesothelioma can metastasize to the lungs. The demonstration of a lesion in one bronchiole which is identical with the neoplastic tissue elsewhere and the demonstration of neoplasm in the mediastinal lymph nodes, pleura, bone, and brain leads to the conclusion that this was a primary neoplasm of the lung. Despite the small size of the original lesion and the tremendous size of the pleural metastases, the author believes that this was a primary bronchogenic carcinoma. This is based on the high incidence of bronchogenic carcinoma, in contrast with the low incidence of mesothelioma, the sites of metastases typical for bronchogenic carcinoma, and the microscopic contiguity of the tumor in the bronchiole with normal epithelium.

#### SUMMARY

An interesting case of carcinoma of the lung is presented in which both the operative and gross autopsy diagnoses were mesothelioma of the pleura. Multiple microscopic sections from about 40 different areas finally demonstrated a small lesion in a minor bronchiole which was identical with the other neoplastic tissue; this was regarded as the primary lesion. Prior to this evidence the author was convinced that this was indeed a case of mesothelioma. Serial sectioning of many blocks may be necessary before the diagnosis can be definitely established in unusual cases which present a histologic picture simulating the description of mesothelioma of the pleura. In our case such a procedure resulted in the diagnosis of carcinoma of the lung arising from a tiny bronchiole rather than a mesothelioma as previously suspected from both clinical and gross autopsy appearance.

#### REFERENCES

1. WAGNER, E.: Das tuberkelähnliche Lymphadenoma. *Arch. f. Heilk.* 11: 497, 1870.
2. WHILLIS, R. A.: *Pathology of Tumors*. The C. V. Mosby Co., St. Louis, Mo., 1918.
3. MOORE, R. A.: *Textbook of Pathology*. W. B. Saunders Co., Philadelphia, Pa., 1915.
4. FOOT, N. C.: *Identification of Tumors*. J. B. Lippincott Co., Philadelphia, Pa., 1918.
5. GESCHICKTER, C. F.: Mesothelial tumors. *Am. J. Cancer* 26: 375-386, Feb. 1936.



6. Massachusetts General Hospital. Case 33111: Mesothelioma of pleura and pericardium, with metastases to right lung and retroperitoneal lymph nodes. *New England J Med.* 236: 407-412, March 13, 1947.
7. ZINNINGER, M. M.: Tumors of wall of thorax. *Ann. Surg.* 92: 1043-1058, Dec. 1930.
8. KILMPEER, P., and RABIN, C. B.: Primary neoplasms of pleura; report of five cases. *Arch. Path.* 11: 387-412 March 1931.
9. ZICKLER, I. T.: Mesothelioma of pleura. *Arch. Int. Med.* 34: 191-205, 1924.
10. PLATT, A. D.: Primary mesothelioma (endothelioma) of pleura; case report. *Am. J. Roentgenol.* 55: 173-180, 1946.

## BIBLIOGRAPHY

1. KARSNER, H. T.: Human Pathology 6th edition. J. B. Lippincott Co., Philadelphia, Pa., 1943.
2. EWING, J.: Neoplastic Diseases, 4th edition. W. B. Saunders Co., Philadelphia, Pa., 1940.
3. ACKLEMAN, L. V., and DEL REGATO, J. A.: Cancer: Diagnosis, Treatment, and Prognosis. The C. V. Mosby Co., St. Louis, Mo., 1947.

Gentleman and Scholar<sup>1</sup>

On a recent visit to Goettingen, the seat of the venerable Georg-August University, I met the renowned pathologist, Gg. B. Gruber, who formerly held the chair of pathology at the university, and is now retired. He told me the following story: In April 1945, when the American troops entered Goettingen, an American medical officer entered the Pathological Institute looking for a place to billet his men. He examined every room in the Institute, and was attracted by the gallery of pictures of pathologists. When he noticed among these a picture of Rudolph Virchow, he said: "A house in which the picture of Rudolph Virchow hangs, whom we Americans admire not only as a scientist but also as a democrat, shall not be occupied by the military." He gave a brisk military salute, and left. The Pathological Institute of Goettingen remained unoccupied.

—Robert Wartenberg, M. D.

<sup>1</sup> *California Med.* 72: 23, Jan. 1950

# Thyroid Cancer in Young Adults

## Report of Four Cases

ROBERT B. STROTHER, *Commander (MC) U. S. N.*<sup>1</sup>

LESTER W. FIX, *Lieutenant (MC) U. S. N.*<sup>1</sup>

A GREAT variance in the incidence of carcinoma of the thyroid gland exists in the literature. Some of this occurs as a result of the different criteria used for the diagnoses of malignancy of the thyroid gland. In addition deviations occur in the incidence in different age, sex, and race groups as well as in the number and duration of the lesions.

Several articles have stressed the high incidence of cancer in nodular goiter (1) (2) (3) (4) and some authorities have stated that they believe all carcinomas of the thyroid to be derived from fetal adenomas or aberrant thyroid tissue (5). However, the incidence varies considerably with different authors and with different types of lesions. Thus, Ward (4) found an incidence of 4.8 percent of thyroid cancer in nodular goiter while Cole et al. (1) found an incidence of 7.2 percent. Further breakdown of Cole's figures shows an incidence of 17.1 percent in nontoxic nodular thyroid masses and 24.0 percent in solitary nontoxic nodules. Warren (6) concurs in the higher incidence of carcinoma in solitary nodules and states that isolated nodules are 10 times more likely to be malignant than any other type of thyroid enlargement.

Opinion is divided as to geographic distribution. Ward (4) states that the incidence of malignancy is influenced by the degree of endemicity and the frequency of nodular goiter. On the other hand in a nongoitrous area such as Boston, Schlesinger et al. (7) report a much higher incidence (4.5 percent) of cancer in the thyroid nodules found at autopsy than Jaffé (8) found in Chicago (0.2 percent). It is interesting to note, however, that the high incidence reported by Cole et al. (1) was found in the same region in which Jaffé's studies were made. There is some conflict in the age incidence of carcinoma of the thyroid and many authors put the average incidence at about 40 years of age or more (1) (11). All agree that cases do occur in youth and this article is written to stress this point. There is general agreement

<sup>1</sup> U. S. Naval Hospital, USNTC, Great Lakes, Ill.

*Past history*—She had delivered a full term normal infant in June 1948. During her pregnancy she had gained considerable weight and she was given thyroid extract in an attempt to reduce her weight.

There was no evidence of previous thyroid disease and no familial history of thyroid disease.

*Physical examination*—The patient was a well-developed, slightly obese young woman. A nodule was found in the left lobe of the thyroid gland. This measured 2 cm. in diameter, was soft, cystic, nontender, and was attached to the left lobe of the thyroid gland. There were no other abnormal masses in the neck.

*Laboratory examination*—Blood counts and urinalyses were normal. Blood

Kahn test was negative. Blood cholesterol was 210 mg per 100 cc blood. The basal metabolism rate was minus 6. Roentgenogram of the chest and neck showed no abnormalities.

An operation was performed on 12 January 1949. A large cystic nodule and about seven eighths of the left thyroid lobe was removed.

Pathologic examination showed a  $5 \times 3 \times 2$  cm mass of thyroid tissue in which there was a well encapsulated grayish-red nodule 2 cm in diameter. Cut sections showed mottled red and white tissue arranged in whorls. In two areas the capsule was grossly penetrated by the reddish-white tissue.



Figure 2.—Case 4. Photomicrograph showing the variations in cellular characteristics ( $\times 100$ ).

Microscopic examination revealed an admixture of types of carcinoma with a predominance of adenocarcinoma (fig 2).

Before the diagnosis of cancer was made, the following criteria were met in all cases: (a) Definite histologic change characteristic of cancer; (b) evidence of capsular invasion; and (c) evidence of lymph and blood vessel invasion.

The Navy Tumor Registry reviewed the cases and concurred in the diagnoses.

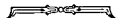
#### SUMMARY

Four cases of carcinoma of the thyroid gland are presented. The cases were in young persons, the oldest being 25 years of age. All presented single nodules of the thyroid gland. In two cases there was a known history of the presence of a thyroid nodule for 4 and 5 years respectively. In a third case the duration of the nodule was unknown, while in a fourth case the nodule was known to have been of very recent origin. All presented minimal or no symptoms. There was adjacent lymph node involvement in one case, while the others showed

A review of the literature reveals that malignant tumors of the thyroid are not rare and that they do occur in the younger age groups. It is of the utmost importance to emphasize the high incidence of malignancy in solitary nontoxic adenoma of the thyroid. This recognition, plus the decreased operative risk of thyroid surgery, makes the removal of single nontoxic adenomas mandatory. The youth, the occurrence in men, and the factor of a single nontoxic nodule are emphasized. The necessity for surgical removal of all single nontoxic nodules of the thyroid is stressed.

## REFERENCES

1. COLE, W. H ; SLAUGHTER, D. P.; and ROSSITER, L. J : Potential dangers of nontoxic nodular goiter. *J A M. A* 127: 883-888, April 7, 1945.
2. CATTELL, R. B : More optimistic approach to cancer of thyroid. *West. J. Surg.* 54: 444-449, Nov. 1946.
3. CRILE, G., J.: Cancer of thyroid. *Postgrad. Med.* 1: 51-57, Jan. 1947.
4. WARD, R.: Malignant goiter. *Surgery* 16: 783-803, Nov. 1944.
5. GARGILL, S. L., and LESSES, M. F. : Diseases of thyroid gland. *New England J Med.* 235: 717-728, Nov. 14, 1946.
6. WARREN, S : Classification of tumors of thyroid, *Am J. Roentgenol* 46: 447-450, Oct. 1941.
7. SCHLESINGER, M. J ; GARGILL, S. L., and SAXE, I. H.: Studies in nodular goiter; incidence of thyroid nodules in routine necropsies in nongoitrous region. *J. A M. A* 110: 1638-1641, May 14, 1938.
8. JAFFÉ, R. H.: Variation in weight of thyroid gland and frequency of its abnormal enlargement in region of Chicago. *Arch. Path.* 10: 887-894, Dec. 1930.
9. VANDERLAAN, W. P : Occurrence of carcinoma of thyroid gland in autopsy material. *New England J. Med* 237: 221-222, Aug. 14, 1947.
10. MEANS, J. H.: Thyroid and Its Diseases. 2d edition. J. B. Lippincott Co., Philadelphia, Pa., 1948.
11. PEMBERTON, J., and LOVELACE, W. R., JR : Malignant lesions of thyroid. *S Clin. North America* 21: 1037, Aug. 1941.



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# Administration of Procaine Intravenously

## V. In Medical Conditions<sup>1</sup>

HOWARD K. PEDIGO, *Major, MC, U. S. A.*<sup>2</sup>

**I**N GENERAL, procaine is used in medicine for the relief of pain. It apparently acts directly on the cells involved in diseased processes as well as on nerve endings and in addition exhibits a general anti-sympathetic action. In diseases of the skin, procaine has been used to treat contact dermatitis, exfoliative dermatitis, and in the pruritus of jaundice to control itching and irritation (1). In the first two instances procaine assists in the cure of the underlying condition by checking the spread of the irritation that results from scratching. It has been tried in the pruritus of infectious granuloma without success. Procaine has been so successful in relieving the urticarias associated with transfusion reactions that some advocate giving it in the transfused blood, if a patient gives a history of previous reactions. Procaine has been successfully used intravenously and intra-arterially to treat cellulitis in an extremity, based on the assumption that the resultant increase in the blood supply to the affected part would improve the nutrition of that part (2). Procaine infusion has been used to relieve the pain associated with herpes zoster (3). It has been used for pain in leprosy ulcers of the legs (4), and has speeded the granulation of atrophic ulcers of the legs. When used to treat very recent frostbite and trench foot, the results were gratifying and the time spent in the hospital was reduced appreciably (5). However, this treatment was not of benefit when applied more than 24 hours after the injury was incurred.

The cardiologists have reported long periods of relief from the pain of angina pectoris in patients in whom no relief was obtained from the use of opiates and nitroglycerin (6). After a series of infusions of a 1-percent solution of procaine, most of these patients were symp-

<sup>1</sup> This concludes this series. Parts I and II were published in the December 1949 issue of the Bulletin of the U. S. Army Medical Department. Part III was published in the January 1950 issue of the U. S. Armed Forces Medical Journal and Part IV was published in the February 1950 issue of the U. S. Armed Forces Medical Journal.

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tom-free up to 6 months. A few patients with cardiac embolism of both sides of the heart have been treated by this means with apparent success (7). The results in the treatment of paroxysmal tachycardia are not conclusive.

Although many reports indicate failure in the use of procaine in asthma, most of the authors observed beneficial results after other medications had failed (8). The action seems to be a reduction of the sensibility of the vegetative nerve endings and relief of the bronchospasm. Procaine infusion has been remarkably successful in a large number of cases of dyspnea. The dyspnea of old age is apparently relieved because of the increase in cardiorenal efficiency and the reduction of the moderate pulmonary congestion that is usually present in such conditions (9). There are reports of the relief of the dyspnea associated with terminal tuberculosis and pulmonary carcinomatosis. It has been used in chronic and acute bronchitis with a reduction of the mucus expectoration as well as of the subjective symptoms. Other authors report an immediate functional improvement when it is used in pulmonary edema (7).

In acute thrombophlebitis, not only has relief of pain been reported, but also by means of venographic studies it has been demonstrated that procaine infusion has resulted in venous patency where none existed before. As an aid to diagnosis, it has allowed the exact area of phlebitis to be outlined by the radiopaque medium (10). In arteritis, increase in the warming of an extremity and in the pulsations of the affected artery has been frequently demonstrated and, at the Brooke General Hospital, intravenous procaine has been used for the relief of the headache associated with temporal arteritis. We have also used it in conjunction with lumbar sympathetic blocks to prolong the action of the block.

Procaine will not prevent anaphylaxis but will suspend some allergies (11). In full-blown serum sickness it has been used with success to relieve promptly the arthralgia and muscular spasm and as a palliative measure for the urticaria that accompanies this condition (12) (13) (14). It has been used with massive doses of neoparsphenamine (as much as 1.05 gm. in one injection) and other arsenical drugs to prevent reactions (15). However, some of the delayed toxic manifestations did occur in a few of these patients, but not the icterus, polyneuritis, and dermatitis of the sensitivity reaction.

A major use in both medicine and surgery is in relieving reflex anuria (16) (17) (18). The use of procaine in this condition is well recognized and fairly widespread. There are instances when a complete anuria has been relieved in a few hours. It is used with success in the anuria and oliguria associated with sulfonamide and arsenical therapy (19). There has been some success in the treatment of acute



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## V. In Medical Conditions<sup>1</sup>

HOWARD K. PRIDGO, *Major, MC, U. S. A.*<sup>2</sup>

**I**N GENERAL, procaine is used in medicine for the relief of pain. It apparently acts directly on the cells involved in diseased processes as well as on nerve endings and in addition exhibits a general anti-sympathetic action. In diseases of the skin, procaine has been used to treat contact dermatitis, exfoliative dermatitis, and in the pruritus of jaundice to control itching and irritation (1). In the first two instances procaine assists in the cure of the underlying condition by checking the spread of the irritation that results from scratching. It has been tried in the pruritus of infectious granuloma without success. Procaine has been so successful in relieving the urticarias associated with transfusion reactions that some advocate giving it in the transfused blood, if a patient gives a history of previous reactions. Procaine has been successfully used intravenously and intra-arterially to treat cellulitis in an extremity, based on the assumption that the resultant increase in the blood supply to the affected part would improve the nutrition of that part (2). Procaine infusion has been used to relieve the pain associated with herpes zoster (3). It has been used for pain in leprosy ulcers of the legs (4), and has speeded the granulation of atrophic ulcers of the legs. When used to treat very recent frostbite and trench foot, the results were gratifying and the time spent in the hospital was reduced appreciably (5). However, this treatment was not of benefit when applied more than 24 hours after the injury was incurred.

The cardiologists have reported long periods of relief from the pain of angina pectoris in patients in whom no relief was obtained from the use of opiates and nitroglycerin (6). After a series of infusions of a 1-percent solution of procaine, most of these patients were symp-

<sup>1</sup>This concludes this series. Parts I and II were published in the December 1949 issue of the Bulletin of the U. S. Army Medical Department. Part III was published in the January 1950 issue of the U. S. Armed Forces Medical Journal and Part IV was published in the February 1950 issue of the U. S. Armed Forces Medical Journal.

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tom-free up to 6 months. A few patients with cardiac embolism of both sides of the heart have been treated by this means with apparent success (7). The results in the treatment of paroxysmal tachycardia are not conclusive.

Although many reports indicate failure in the use of procaine in asthma, most of the authors observed beneficial results after other medications had failed (8). The action seems to be a reduction of the sensibility of the vegetative nerve endings and relief of the bronchospasm. Procaine infusion has been remarkably successful in a large number of cases of dyspnea. The dyspnea of old age is apparently relieved because of the increase in cardiorenal efficiency and the reduction of the moderate pulmonary congestion that is usually present in such conditions (9). There are reports of the relief of the dyspnea associated with terminal tuberculosis and pulmonary carcinomatosis. It has been used in chronic and acute bronchitis with a reduction of the mucus expectoration as well as of the subjective symptoms. Other authors report an immediate functional improvement when it is used in pulmonary edema (7).

In acute thrombophlebitis, not only has relief of pain been reported, but also by means of venographic studies it has been demonstrated that procaine infusion has resulted in venous patency where none existed before. As an aid to diagnosis, it has allowed the exact area of phlebitis to be outlined by the radiopaque medium (10). In arteritis, increase in the warming of an extremity and in the pulsations of the affected artery has been frequently demonstrated and, at the Brooke General Hospital, intravenous procaine has been used for the relief of the headache associated with temporal arteritis. We have also used it in conjunction with lumbar sympathetic blocks to prolong the action of the block.

Procaine will not prevent anaphylaxis but will suspend some allergies (11). In full-blown serum sickness it has been used with success to relieve promptly the arthralgia and muscular spasm and as a palliative measure for the urticaria that accompanies this condition (12) (13) (14). It has been used with massive doses of neoarsphenamine (as much as 1.05 gm. in one injection) and other arsenical drugs to prevent reactions (15). However, some of the delayed toxic manifestations did occur in a few of these patients, but not the icterus, polyneuritis, and dermatitis of the sensitivity reaction.

A major use in both medicine and surgery is in relieving reflex anuria (16) (17) (18). The use of procaine in this condition is well recognized and fairly widespread. There are instances when a complete anuria has been relieved in a few hours. It is used with success in the anuria and oliguria associated with sulfonamide and arsenical therapy (19). There has been some success in the treatment of acute

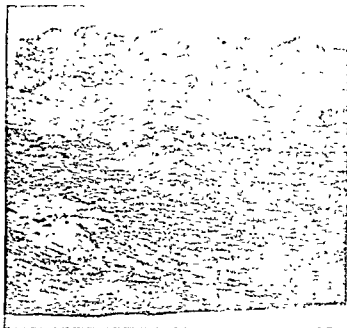
Late in November 1947, he was readmitted with a severe recurrence of his previous symptoms plus severe generalized edema of legs, thighs, back, arms, and abdomen. The urine at this time contained 4 plus albumin. During a 5-month course of treatment the patient was kept in cardiac compensation only by the vigorous use of mercurial diuretics, as well as digitalis. On 6 April 1948 he was transferred to another hospital in a state of cardiac decompensation, with a diagnosis of hypertensive cardiovascular disease. He died of pulmonary edema less than 24 hours after admission, despite all therapy.

At autopsy the heart was found to be almost twice the normal size. The entrances to both chambers were dilated. The wall of the left chamber was 17 mm. thick in the midsection. The endocardium was white. The trabeculae were flattened and changed to white cords especially in the region of the posterior wall. In the heart muscle at this site, there was an extensive white scar. The medial mitral valve was thickened by fibrous tissue. The chordae tendineae were thin. The wall of the right chamber was 6 mm. thick. The chordae tendineae of the tricuspid valve were thin. Between the strongly developed trabeculae in the region of the apex rounded parietal thrombi were found. The pulmonary valves were thin. The circumference of the pulmonary artery just above the valves was 8 cm. The right auricle was dilated. In the auricle, numerous parietal half-rounded projecting thrombi were present. The foramen ovale was closed. In the intima of the coronary arteries there were many fatty and fibrotic plaques which narrowed the lumen.

At the origin of the aorta there were only two half-moon-shaped valves, one behind and one in front. At the right commissure the two valves formed a spur 15 mm. long that was directed upward. In the region of the forward facing valve, the right coronary artery arose about 1 cm. to the left of the spur and the left coronary artery arose 1 cm. to the right of the other commissure. The forward valve showed comblike chalky projections directed outward. Both sinuses of Valsalva were dilated almost to hemispheres. The valves, themselves, were tightly stretched. The circumference of the aorta at the level of the valves was 13 cm. The inner wall of the ascending aorta showed many flat, yellow plaques. The lumen was dilated backward and to the right so that the circumference, in this part, was enlarged to about 14 or 15 cm., then, shortly before the origin of the vessels of the neck, returned to 7 cm. Above the posterior valve, the aortic wall showed an almost T-shaped tear of the inner layers of the wall. Between the edges of the tear a smooth internal covering over white connective tissue was seen. The cross-piece of the T was about 1 cm. above the base line of the valves and the stem of the T ran zig zaggedly upward. The cross-piece was 4 cm. and the upward running stem about 6 cm. long.

The circumference of the innominate artery was 5 cm., of the right and left subclavian arteries 4.6 cm., and the diameter of both carotids was about 2.5 cm. The internal mammary arteries measured 2 cm. at the level of the third rib. There were fatty plaques in the intima of all these vessels. About 2.5 cm. below the origin of the left subclavian artery, the aorta narrowed into a flat-topped mound at the top of which was a hole through which only the finest probe could be passed. The probe passed through a channel and, after overcoming a slight obstacle, into a portion of the descending aorta which measured 5 cm. in circumference at this point and showed no fatty intimal plaques. All the abdominal viscera and the extremities showed moderate passive congestion. Brawny induration with hemorrhagic infarcts on the right was found in the lungs. Microscopic sections of various levels of the aorta and its tributaries were stained with various preparations. The most valuable of these for demonstrating the chro-

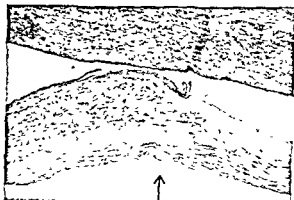
Figure 1.—Aorta above stenosis illustrating media necrosis: elastic tissue stain (resorcinol fuchsin).



motropic substance in the vessel wall was Feyrter's "closed staining" with tartaric acid thionine which brought out the red metachromasia of this substance in the vascular wall especially clear after previous treatment with 95 percent alcohol. The media of the descending aorta above the stenosis (fig. 1) showed the clearly demarcated elastic membranes which stained strongly with resorcinol fuchsin. Between the membranes and about the muscle fibers, especially the paler colored fibers, chromotropic substance was scantily deposited and was found mainly in the inner layers of the media. A slight thickening of the intima was seen through the heavy deposit of fine collagenous fibers. The changes in the transverse aorta beyond the tear were similar to those described. Interruptions were seen in the elastic membranes here and there and were in places visible only as fragments. The number of unstained muscle fibers, as shown by the lack of nuclei, was augmented in spots so that small areas of the media appeared empty of nuclei. In such places, the deposit of chromotropic substance was unusually heavy.

The elastic membranes of the ascending aorta near the tear (fig. 2) were interrupted in indefinitely bordered areas which sometimes ran perpendicular to the intima and sometimes parallel to it. Such areas might run into each other revealing wholly irregular, elastica-free regions. Where elastic tissue remained, the membranes did not run uniformly, but consisted of broken fragments of elastic tissue held together by fine fibers or more homogeneous masses which stained palely with resorcinol fuchsin. The regions of muscle fiber disappearance appeared more frequent and larger than in the transverse aorta and in such areas the fragmentation of the elastica appeared increased. Chromotropic substance was abundant and often appeared as a cystic collection. Here, there were also signs of growth of young connective tissue.

At the site of the tear the edge was a slightly rounded ridge covered by intima, and a projection of the media from the rupture site in the form of a flap appeared in only one section. At the border of the rupture the media ended almost entirely; only the outermost layers could be recognized as scattered, partially clumped elastic fibers and membranes at the base of the rupture. The inner



*Figure 2.—Aorta at site of rupture (arrow) and adjacent aortic elastic tissue (resorcinol fuchsin stain).*

layers of the ruptured area were formed by young connective tissue rich in star-shaped cells that also clothed the clifflike edge of the rupture and was continuous with the intima of the intact portion of the aorta. The adventitia contained more fibers and was more densely woven in the ruptured area. On examination the narrowed portion of the aorta in serial section revealed that the lumen was not completely obliterated, but was narrowed to between 1 and 2 mm, the diameter of the whole aorta in this area was about 8 mm, and the thickness of the media was 3 mm. The whole intima in this area was thickened by fibrosis. The media contained irregularly coursing elastic membranes and the media of the internal mammary, internal carotid, and subclavian arteries contained from 15 to 20 parallel coursing and communicating elastic membranes. Chromotropic substance was abundant, and the intima was thickened by extremely fine fibers and was about half the thickness of the media. The medial necrosis here was as severe as in the ascending aorta in contrast to the descending aorta which was only slightly involved.

The liver, spleen, and trachea showed only the signs of chronic, passive congestion. The pathologic diagnosis was (a) coarctation of the aorta with definite collateral vessel formation, (b) a bicuspid aortic valve, (c) medial necrosis of the aorta with a healed rupture, and (d) enlargement and dilatation of the heart with congestive failure.

#### DISCUSSION

The coexistence of aortic aneurysm and coarctation of the aorta was discussed by Hamilton and Abbott (6) who collected 38 cases. Of these, 15 came to autopsy, 14 of which showed microscopic changes consisting of medial alterations interpreted then, as representing degenerative processes weakening the medial walls. These were all studied before the publication of Erdheim's paper on the specific changes of medial necrosis and now probably would be classified as such (14). Only two cases, both published subsequently, showed the changes of medial necrosis above the coarctation with normal aortas below (1) (4). In neither case was the histologic findings of the



*Figure 3.—Roentgenogram of excised sternum and anterior portion of the ribs illustrating anterior notching and erosion of the ribs and enlargement of the mammary arteries.*

other elastic-walled vessels mentioned. The microscopic findings of the vessels involved in the collateral circulation that arises in aortic coarctation is rarely mentioned in the literature. The present case is of interest as a third case in the literature in which there was medial necrosis above the coarctation and none below it. It is of special interest in that the medial necrosis extended into all other elastic

vessels which were subject to the patient's hypertension. This was even true of the internal mammary arteries which, in addition, showed an elastic type of structure instead of the usual muscular type. All of this suggests hypertension as a special factor in the etiology of medial necrosis.

Concerning the healed rupture the question arises as to whether this was really a rupture, perhaps 6 months old, in which intimal proliferation had covered a shallow tear, the media of which was simultaneously strengthened by a young connective tissue proliferation. Another possibility is that this represented a stage in every rupture caused by medial necrosis, a stage at which the media is stretching and yielding while the connective tissue formation is gradually falling behind in the process of repair, the intima, meanwhile, covering the weak stretching and widening chasm. In such a condition the strain would eventually become great enough to cause rupture of the few remaining bridging elements. The tear would then suddenly become complete and the typical findings of aortic rupture would ensue. This hypothesis could be checked by a microscopic review of fresh cases of rupture, looking for evidence of a previous connective tissue proliferation at the edges and base of the tear.

It is interesting that the coarctation was completely missed clinically, despite several fluoroscopic and roentgenographic examinations of the chest for heart size. In view of the prominent rib erosion noted on the roentgenogram of the removed anterior chest wall after death (fig. 3), it must be assumed that the changes were not found previously because they were not looked for. It is, therefore, important to reemphasize the fact that coarctation frequently does not cause death until late in life.

#### REFERENCES

1. KENNEY, T. D.; SYLVESTER, R. E., and LEVIN, S. A.: Coarctation and acute dissection of aorta associated with pregnancy. *Am J M Sc* 210: 725-732, Dec 1945.
2. STRASSMAN, G.: Plötzlicher Tod bei Stenose des Isthmus Aortae. *Beitr z gerichtl Med* 5: 91, 1922.
3. KATZ, H.: Ueber den plötzlichen natürlichen Tod in Schwangerschaft, Geburt und Wochenbett. *Arch f Gynäk*, 115: 283-312, Nov. 1922.
4. HARRISON, F. F.: Coarctation of the aorta of the adult type associated with cystic degeneration of media in first portion of arch. *Arch. Path.* 27: 742-747, April 1939.
5. GLOGGENTRESSER, W.: Sogenannte Spontan Rupture der Aorta bei Isthmusstenose und Media Necrosen der Aorta. *Ztschr. f Path.* 56: 11, 1941.
6. HAMILTON, W. F., and ABBOTT, M. E.: Coarctation of aorta of adult type. *Am Heart J* 3: 381-421, April 1928.
7. ABBOTT, M. E.: Coarctation of aorta of adult type. *Am. Heart J.* 3: 574-618, June 1928.

8. SCHNITKER, M. A., and BAYER, C. A.: Dissecting aneurysm of aorta in young individuals, particularly in association with pregnancy with report of case. *Ann. Int. Med.* 20: 486-511, March 1944.
9. *Handbuch der Speziellen Pathologischen Anatomie und Histologie.* Volz Berlin, 1924.
10. BONNET, L. M.: Su la lesion tête stenose congenitale de l'aorte. *Rev. de Med.*, Paris 23: 108-481, 1903.
11. BLALOCK, A., and PARK, E. A.: Surgical treatment of experimental coarctation (atresia) of aorta. *Am. Surg.* 119: 445-456, March 1944.
12. CRAWFORD, C., and NYLIN, G.: Congenital coarctation of aorta and its surgical treatment. *J. Thoracic Surg.* 14: 347-361, Oct. 1945.
13. SHUMACKER, H. B., Jr.: Coarctation and aneurysm of aorta; case report treated by surgery. *Ann Surg.* 127: 653-665, April 1948.
14. ERDMANN, J.: Medionecrosis aortae idiopathica. *Virchow's Arch. f. Path. anat.* 273: 454, 1922; and 276: 187, 1924.



## Pulmonary Resection for Lung Abscess<sup>1</sup>

A review of the literature reveals a case fatality rate of about 37.5 percent in hospitalized cases of pulmonary abscesses. Transthoracic drainage and chemotherapeutic agents have greatly improved the progress in acute cases, but the mortality in chronic cases has remained high. A classification of lung abscesses as simple and complicated is extremely useful. The simple abscess is characterized by a single cavity and no associated pathologic changes. The complicated abscess, on the other hand, may have several daughter abscesses, extreme pneumonitis, fibrosis, or bronchiectasis. While adequate drainage of a simple lung abscess may result in cure, drainage of the major focus of a complicated abscess, with healing of that abscess cavity, still leaves significant pulmonary pathologic changes present, and the patient cannot be considered well.

The preoperative study of these patients should include X-ray localization of the cavity, bronchoscopy, and bronchography. At the Fitzsimons General Hospital, pulmonary resection was performed in a series of 38 cases, 36 of them complicated. Bronchiectasis was the most frequent complication. Pulmonary resection is the treatment of choice for complicated lung abscess. The management of upper lobe abscess presents a special problem because of inadequacy of bronchoscopic visualization of this area. Lung abscesses occurring in the upper lobes should be treated by pulmonary resection regardless of whether or not complicating factors can be demonstrated preoperatively. This is of particular importance in the management of patients in the middle and older age groups because of the possibility of the presence of a bronchozoenic carcinoma. Postoperative empyema occurred in 5 patients in this series, and death occurred in 3, a fatality rate of only 7.9 percent.

<sup>1</sup> NEERKEN, A. J., and GROW, J. B.: *Abstr. J. Thoracic Surg.* 15: 739-741, Oct. 1949.



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<sup>1</sup> NIKERKEY, A. J., and GROW, J. B.: *Abstr. J. Thoracic Surg.* 18: 739-741, Oct. 1949.



Figure 3

ureters were catheterized with ease. Normal excretion of phenolsulfonphthalein was obtained from the right catheter but no excretion from the left after 35 minutes. Retrograde pyelograms were normal (fig 3). Retrograde pyelograms made 2 months later revealed no change. The patient continued to have mild attacks of pain in both flanks. Surgical intervention was contra-indicated because of the possibility of precipitating a fatal thrombosis of his right kidney.

#### DISCUSSION

The diagnostic criteria for massive renal infarction caused by renal artery thrombosis are: (a) An onset with acute pain in the flank in which trauma may or may not be a factor; (b) a nonfunctioning kidney as revealed by intravenous pyelograms and divided excretion tests; (c) normal findings in the retrograde pyelogram; (d) a history of gross or microscopic hematuria and albuminuria; and (e) in some patients a cardiovascular disease or a blood dyscrasia. Although kidney infarction is mentioned in Cecil's Textbook of Medicine as a complication of polycythemia vera, a perusal of the literature fails to disclose any recorded cases. Case 2 was not proved by operation or autopsy, but it fulfills the previously mentioned criteria. The functionless infarcted kidney should be removed except when there is a definite contra-indication to operation. It definitely increases the chances for infection and the development of hypertension.

#### REFERENCES

1. REGAN, F. C., and CRABTREE, E. G. Renal infarction; clinical and possible surgical entity. *J. Urol.* 59: 981-1018, June 1948.
2. STEGEMAN, W. Renal vessel thromboses. *Urol & Cutan Rev* 52: 710-712, Dec. 1948.

3. SHEA, J. D.; SCHWARTZ, J. W.; and KORILAK, R. W.: Thrombosis of left renal artery with hypertension, case report. *J Urol* 59: 302-306, Mar. 1948.
4. SCHWARTZ, J. W., and IREX, N. S.: Post-caval ureter, report of case. *Urol. & Cutan. Rev* 53: 327-329, June 1949



## Residency Training

To permit advanced planning and the careful selection of applicants, applications for residency training in military hospitals for any of the specialties may be forwarded at any time to the cognizant office of the Army, Navy, or Air Force:

*Army:* The Surgeon General, Attention Personnel Division, Career Management Branch.

*Navy:* Chief, Bureau of Medicine and Surgery, Attention Professional Division.

*Air Force:* The Surgeon General, U. S. Air Force, Attention AFCSG-26.

The final date for which applications will be considered for training to begin as of 1 July of any given year for Army and Air Force residents will be announced soon.

The Advisory Board of the Bureau of Medicine and Surgery will announce the beginning date for Navy residency training by letter.

Residencies in certain specialties such as General Surgery, Internal Medicine, Dermatology and Syphilology, and Obstetrics and Gynecology are limited, whereas they are readily available in other specialties, such as Pathology, Radiology, Urology, Psychiatry, Physical Medicine, and General Practice.

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3. SHIFA, J. D.; SCHWARTZ, J. W.; and KOBILAK, R. W.: Thrombosis of left renal artery with hypertension; case report. *J. Urol* 59: 302-306, Mar. 1948.
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diuresis began. At autopsy, the primary cause of death was found to be hypostatic pneumonia.

**Case 2**—A M J, a 25-year-old man, was admitted following injury in an automobile accident in which he sustained multiple fractures including a comminuted fracture of the pelvis and left femur, with concomitant massive edema. Deep shock which occurred immediately after the accident, was overcome with plasma and whole blood transfusions but on the fourth day extreme oliguria occurred. The previous day, the urinary output had been only 23½ cc. When oliguria occurred, 15 cc of 1 percent procaine was given intravenously. The urinary output during the next 24 hours decreased to a total of only 13½ cc. In this case intravenous procaine was not repeated because of the lack of results from the initial dose. He was observed and treated in the same manner as case 1.

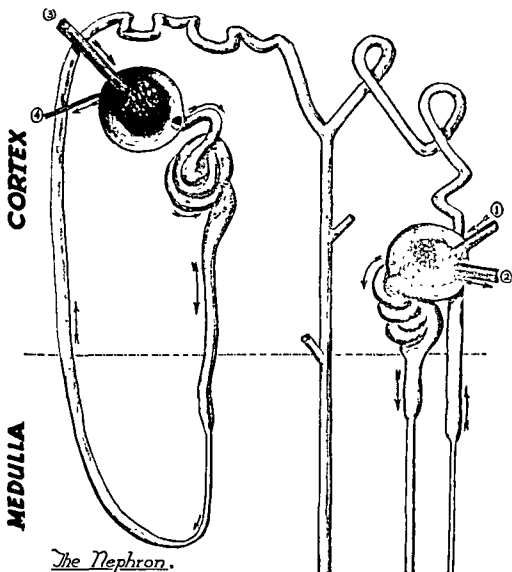
Ten days after oliguria appeared, his urinary output rose to 375 cc. On the eleventh day it was 637 cc. During this same period of time, his nonprotein nitrogen demonstrated a steady rise, reaching 200 mg per 100 cc blood on the eleventh day. His blood pressure also continued to rise, and on the eleventh day was 208/94. Although his fluid intake was restricted to 1,000 cc plus an amount equal to the daily urinary output, his course was progressively downhill, and on the twelfth day after the onset of oliguria he had acute pulmonary edema. Supportive measures such as oxygen administered by positive pressure, digitoxin, and phlebotomy were used. He died approximately 6 hours after the onset of pulmonary edema. Autopsy showed the primary cause of death to be acute pulmonary edema.

### ETIOLOGY

Lower nephron nephrosis can be caused by a large number of conditions, including crushing injuries, sulfonamide intoxication, blood transfusion reactions, and intravascular hemolysis following transurethral prostatic resections.

Trueta (3) and his coworkers have found that, although the efferent vessel of the cortical glomerulus is of small caliber, the similar vessel of the juxtamedullary glomerulus is large, at times being equal to or even larger than the afferent vessel (fig. 2). They also found that the efferent vessels of the cortex drain into cortical capillaries of small caliber, while the efferent vessels of the juxtamedullary glomerulus drain into the vasa recta, which are straight medullary vessels of large caliber. The basic importance of the large caliber of these efferent vessels becomes apparent when one considers the large amount of blood that must flow through the juxtamedullary glomeruli when the medullary bypass acts as the principal vascular functioning unit.

Trueta has pointed out that in the presence of vasoconstriction, the blood will flow through the point of least resistance, i. e., through the large efferent vessels of the juxtamedullary glomeruli, rather than the comparatively narrower ones of the cortex. Also, it was demonstrated that the portions of the nephron receiving blood richest in oxygen are those situated in the medullary ray, as the capillaries surrounding



The Nephron.

*Note the relative equality in size of the afferent ① and efferent vessels ② of the juxtamedullary glomerulus as compared to that of the cortical glomerulus ③④ (as suggested by TRELPA and STUDIES OF THE RENAL CIRCULATION)*

Figure 2.

these portions obtain their blood supply directly from the efferent vessels of the cortical glomeruli. The proximal and distal convoluted tubules receive poorly oxygenated blood, as their capillaries receive blood that has already passed through the arterial side of the cortical intertubular bed. It is apparent that, in the event of a medullary bypass far less blood than normal would go to the renal cortex and the amount of oxygenated blood reaching the distal convoluted tubules



## SYMPTOMS

The chief symptoms and signs of the syndrome of lower nephron nephrosis are: (a) Shock; (b) vomiting; (c) oliguria and anuria; (d) hypertension (Lucke (2) found in his series of cases, that on the first day, there would be a drop in blood pressure to shock levels, on the second day there would be a return to normal, and on the third day he found a rise to approximately 150/90, following this there would be a maintenance at approximately this same level, or there would be a further increase), (e) edema (Lucke found this to be a variable phenomenon, usually being slight or moderate in extent); and (f) uremia with its attending symptoms and signs.

## PATHOLOGY

Lucke (2) has described in detail the pathologic changes found in the kidney in lower nephron nephrosis. He finds that the essential changes appear to be restricted to the lower segments of the nephrons.

Degeneration or actual necrosis involves the thick tubules of Henle as well as the distal convoluted tubules. Edema and cellular reaction occur in the stroma around the more severely damaged portions of the tubules. Thrombosis of adjacent veins in this area is frequently a concomitant finding. He found casts of a heme compound lying within the lumens of a variable number of tubules in the lower segments and of portions of the nephrons (fig. 3), i. e., the renal corpuscles and the proximal and intermediate segments.

Ayer and Gauld (18) have described the sequence of pathologic

changes in the kidneys following intravascular hemolysis. They present the autopsy findings in 7 patients who died 3 hours to 10 days following hemolytic reactions:

*Three hours after hemolysis:*

- (a) Glomerular swelling
- (b) Slight cloudy swelling of the proximal convoluted tubules and pale acidophilic material in their lumens, becoming dark red to brown in the distal convoluted and collecting tubules.



Figure 3—Photomicrograph of post-mortem kidney tissue ( $\times 200$ ). Note deposition of pigment in tubules even though the patient died 37 days after the onset of oliguria.

*Third day:*

- (a) Considerable brick-red pigment within the cells of the distal convoluted tubules and some sloughing of these cells.

*Sixth day:*

- (a) Considerable interstitial edema and leukocytic infiltration around the convoluted tubules.
- (b) Marked desquamation of the tubular cells
- (c) Some of the pigment of the lumens appeared to be turning greenish-yellow.

*Seventh day:*

- (a) A few mitotic figures began to appear in some of the tubular cells which the authors considered an indication of attempts at repair
- (b) The destruction of tubular cells as well as interstitial infiltration and edema were still pronounced.

*Tenth day:*

- (a) There now appeared complete destruction of some of the tubules, these being replaced by inflammatory cells and fibroblasts.
- (b) Numerous cellular casts were present in the distal convoluted and collecting tubules.
- (c) Nearly all the inflammation appeared to be around the distal convoluted tubules.

Some have claimed that the deposition of casts is the primary cause of anuria. Lucke (2) has found a large discrepancy in the number of casts found in different cases. He states that they are rarely entirely absent, although in some cases, these casts are conspicuous in every microscopic field.

The regeneration of the tubular epithelium is rapid; Lucke found that within less than 10 days the majority of the damaged areas are completely relined.

McLaughlin et al. (19) believe that one can usually explain the anemia associated with the oliguria syndrome on the basis of hemolysis, hemorrhage, hemodilution (as that found with irrigating solution), and a depression of hemopoiesis by nitrogenous wastes.

Trueta et al. (3) have raised the question as to the possibility that a diversion of the intrarenal blood through the medullary bypass could cause a cortical ischemia of sufficient degree to cause the liberation of a pressor substance, thus causing hypertension.

## TREATMENT

It has been demonstrated (12) that stimulation of the renal vasomotor nerves diverts the renal blood flow from the cortex (which ordinarily receives most of the blood flow) to the medulla, resulting in renal cortical ischemia. On the basis of experimental work it appears that this vasomotor mechanism may be the basis for the renal cortical ischemia seen in the crush syndrome and similar conditions, and that

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this is especially indicated in those cases in which sulfonamide crystals are not recovered from ureteral catheterization. He adds that "No patient suffering from anuria caused by sulfa drug sensitivity should be permitted to die from anuria without surgical intervention (decapsulation), unless there are hopeless organic conditions which contraindicate the operative procedure."

Abeshouse and Tankin (28) believe that decapsulation is indicated in those cases of persistent oliguria or anuria which follow sulfadiazine or sulfathiazole administration after the presence of calculi or concretions in the pelvis or ureter have been ruled out. In the case of nonobstructive anuria of the reflex or secretory type, the authors believe that one can trace the beneficial effect of decapsulation directly to the interruption and destruction of the sympathetic nerve supply to the kidney.

Shapiro (29) urges early decapsulation in certain types of sulfonamide anuria, warning of the danger of irreversible kidney changes that may occur if the anuria persists too long.

A number of authors (30) (31) (32) have reported cases of oliguria and anuria following transfusion in which they attributed beneficial results to renal decapsulation.

#### SUMMARY

Lower nephron nephrosis occurs after such conditions as crushing injury, sulfonamide intoxication, blood transfusion reaction, intravascular hemolysis, and following transurethral prostatic resection. There are a number of concepts regarding the mechanism of anuria in lower nephron nephrosis. The work of Trueta and others indicates that the underlying factor is a renal cortical ischemia which occurs because of stimulation of the renal vasomotor nerves and diversion of the renal blood flow from the cortex to the medulla. The cortex becomes ischemic and thus occurs the renal cortical injury seen in the crush syndrome and allied states. It has been suggested that this mechanism may be prevented by blocking the renal vasomotor pathways, e. g., caudal high spinal anesthesia or splanchnic block. As Corcoran and Page have suggested, this is well worth trying early in these conditions.

In the cases presented, no increase in diuresis followed the intravenous injection of procaine hydrochloride. Nevertheless, this still may be a step in the right direction to combat the deleterious effect of the medullary bypass on the function of the kidney. It may be that, in order to effectively accomplish this, the amount of procaine administered will have to be increased. Perhaps, nerve block or decapsulation with denervation will prove to be the most effective

single procedure (other than dietary and fluid restriction) in the treatment of lower nephron nephrosis.

Treatment should include restriction of fluid intake to an amount equal to that lost; maintaining protein electrolyte and pH balance. If the patient survives for a period of 10 to 14 days, regeneration of the tubule will occur usually after the tenth day and diuresis will then begin.

#### REFERENCES

1. FRIS, N. P.: Sulfathiazole anuria cured by means of intravenous plasma treatment. *J. Urol.* 61: 184-186, Feb. 1949.
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4. MILLIKEN, L., and KARR, W. G.: Influence of nerve on kidney function in relation to problem of renal sympathectomy. *J. Urol.* 13: 1-23, Jan. 1925.
5. FISCHER, K.: Anatomie und physiologie der nervi proprii der nieren kapsel und ihre bedeutung fur die nieren chirurgie. *Deutsch. Ztschr. f. chir.* 222: 228-273, Feb. 1930.
6. THORN, G. W.: Treatment of renal insufficiency. *J. Urol.* 59: 119-148, Feb. 1948.
7. CORCORAN, A. C., and PAGE, I. H.: Crush syndrome. *J. A. M. A.* 134: 436-441, May 31, 1947.
8. MASON, J. B., and MANN, F. C.: Effect of hemoglobin on volume of kidney. *Am. J. Physiol* 98: 181-185, Sept. 1931.
9. FLINK, E. B.: Certain aspects of hemoglobinemia: Thesis of the Graduate School of Medicine of the University of Minnesota, 1945.
10. YUILLE, C. L.; GOLD, M. A.; and HINDS, E. G.: Hemoglobin precipitation in renal tubules: study of its causes and effects. *J. Exper. Med.* 82: 361-374, Nov. 1945.
11. PETERS, J. T.: Oliguria and anuria due to increased intrarenal pressure. *Ann. Int. Med.* 23: 221-236, Aug. 1945.
12. FRANKLIN, K. J.; BARCLAY, A. E.; DANIEL, P.; TRUETA, J.; and PRITCHARD, M. M. L.: Renal pathology in light of recent neurovascular studies. *Lancet* 2: 237-238, Aug. 17, 1946.
13. CREEVY, C. D.: Hemolytic reactions during transurethral prostatic surgery. *J. Urol.* 58: 125-131, Aug. 1947.
14. FOLFY, F. E. B.: Personal communication to C. D. Creevy.
15. LANDSTEINER, D. K., and FINCH, C. A.: Hemoglobinemia accompanying transurethral resection of prostate. *New England J. Med.* 237: 310-314, Aug. 28, 1947.
16. BRODIE, B. B.; UDENFRIED, S.; and COBURN, A. F.: Determination of salicylic acid in plasma. *J. Pharmacol. & Exper. Therap* 80: 114-117, Jan. 1944.
17. CREEVY, C. D.: Importance of hemolysis during transurethral prostatic resection; a clinical investigation. *J. Urol.* 59: 1217-1222, June 1948.
18. AYER, G. D., and GAULD, A. G.: Uremia following blood transfusion; nature and significance of renal changes. *Arch. Path.* 33: 513-532, April 1942.
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20. SNAPPER, I.: Management of acute renal failure. *Bull. New York Acad. Med.* 25: 199-227, April 1949.



21. ROEST, J. G. G.: Protein catabolism in uremia. *Lancet* 1: 824-828, May 29, 1948.
22. BURWELL, E. L.; KINNEY, T. D.; and FYNCH, C. A.: Renal damage following intravascular hemolysis. *New England J Med* 237: 657-658, Oct. 30, 1947.
23. OSMOND, J. K., and BEST, J. W.: Anuria, report of 27 cases. *J Urol* 61: 608-623, March 1949.
24. LATTIMER, J. K.: Plan for management of anuria. *J Urol* 54: 312-317, Sept. 1945.
25. REIF, H. A., and BRAMLEY, H. F.: Bichloride of mercury poisoning. *J Urol* 49: 583-589, April 1943.
26. VERMEULEN, C. W., and SNEAD, C. R.: Effect of renal decapsulation in experimental mercury nephrosis. *J Urol* 60: 216-220, Aug. 1948.
27. KLEIMAN, A. H.: Sulfathiazole anuria with recovery following renal decapsulation. *J Urol* 56: 598-601, Nov. 1946.
28. ABBESHOUSE, R. S., and TASKIN, L. H.: Renal complications of sulfonimide therapy. *J Urol* 56: 658-667, Dec. 1946.
29. SHAPIRO, I. J.: Decapsulation of kidney for anuria due to sulfathiazole. *J. Urol* 59: 538-543, April 1948.
30. BANCROFT, F. W.: Anuria following trans-fusion, effect of decapsulation of both kidneys. *Ann. Surg* 81: 737-738, April 1925.
31. RAVICH, A.: Transfusion reaction with anuria and uremia cured by unilateral renal decapsulation. *M. Rec* 154: 403-405, Dec. 3, 1941.
32. FLO, S. D., and CUMMINGS, H. W.: Unilateral decapsulation of kidney for trans-fusion of oliguria. *Surgery* 14: 216-222, Aug. 1943.



## Surgical Management of Ulcer<sup>1</sup>

Surgical management of ulcer in the past has been far too empiric. A three-quarter gastric resection performed with due regard to established physiologic principles appears to thwart the obstinate ulcer diatheses which have remained refractory to psychiatric and medical management, more effectively than any known agency. The surgeon who relies upon the excision principle but who fails to excise enough stomach, or who leaves the antral mucosa or who re-establishes continuity by employment of a long proximal duodenojunal loop—the surgeon who does any of these—is performing an ulcer-abetting operation and is inviting ulcer recurrence. The role of vagotomy in the management of ulcer remains to be determined.

<sup>1</sup> WAGENETTES, O. H.: Role of surgeon in management of peptic ulcer. *Wisconsin M. J* 48: 915-919, Oct. 1949.

# Disfiguring Malocclusion

## Correction by Cosmetic Prosthesis

PIERRE O. EVANS, Major, DC, U S. A.<sup>1</sup>

ON 30 August 1948, a 26-year-old woman reported to the dental clinic complaining of a disfiguring malocclusion (fig 1). She was able to close her lips only by pursing them. The central incisors were becoming sensitive to air thermal changes, and there was no incisive contact obtainable even with the furthest protrusion of the mandible. She also had difficulty enunciating words containing "s," "sh," "ch," and "f." Roentgenograms and study models were obtained. The overjet measured 10.5 mm and the lower anterior teeth were in slight linguoversion from the left cuspid to the right lateral incisor. The roots and teeth were of slightly larger size than would normally be expected. The alveolar bone was of good density and a mild general gingivitis was present. The profile was such that correction of the lower anterior teeth would accomplish little cosmetically, while the upper lip was foreshortened and curled.

In view of these facts, it was decided that removal of the upper central and lateral teeth, and an alveolectomy, would give a satisfactory anterior maxillary reduction with a good cosmetic result, improved function, and better speech. Removal of the upper left cuspid in order to allow a more perfect arch alignment was considered, but because of the comparative strengths of the cuspid and first bicuspid as abutments this was not done. Trial removal of the



Figure 1.

teeth and an alveolectomy was performed on the model, and the amount of alveolectomy was determined to be between 4 and 5 mm. at the crest of the central region. On this basis, articulated models were prepared and a clasless partial denture constructed, as well as a clear acrylic surgical tray for accuracy in the alveolectomy.

The teeth and alveolar bone were removed by the oral surgeon under procaine anesthesia, using extraoral infra-orbital injections to reduce the chance of post-operative swelling. The partial denture was inserted and was worn for 3 months (fig. 2). The cuspids were rather long and since the terminal end of the root canal was about 4 mm. from the incisal edge, it was decided that 2 mm. reduction of that edge could be accomplished in the three-quarter crown preparations. Crowns were prepared on this basis, seated, and full impressions taken which were poured in artificial stone. A piece of retention mesh wax was

<sup>1</sup> Madigan General Hospital, Tacoma, Wash.

*Figure 2**Figure 3.*

bent lengthwise into a V or narrow trough and placed along the crest of the ridge from the mesial surface of one cuspid crown to the other with the open portion of the trough tissueward. The labial portion was placed sufficiently toward the lingual surface to allow 1.5 to 2 mm. of tooth material to be placed in position to make the final labial arch form. The mesh was cast in three-quarter crown gold and spot soldered to the abutments which left the stone cast intact.

Teeth of the proper shape were chosen and the lingual surface of these teeth ground out to allow them to be set tightly against the gold mesh and make the final labial arch form. White beeswax was poured from the lingual aspect through the mesh and then carved into lingual tooth surfaces. The case was invested, the wax boiled out, and acrylic dough of the proper shade was forced through the mesh to the acrylic teeth and processed. The finished bridge showed gold only around the three-quarter crowns. The arch of the bridge was structurally strong because of the cast gold mesh. The attachment of the acrylic teeth to the mesh with acrylic was quite strong, and the compatibility of the gingival tissue to the acrylic material was excellent. The final cosmetic result is shown in figure 3, 3 months after the final bridge insertion.



# Cleft Palate Prosthesis

ELLSWORTH K. KELLY, *Lieutenant Colonel DC, U S A*<sup>1</sup>

THE use of artificial material for closing the congenital cleft palate to aid speech and deglutition, dates from ancient times and probably was the first type of oral prosthesis. Many types and forms of obturators have been used in the past, but the restorations now used may be classified as the hinged bulb, the rigidly attached bulb, and the flexible velum. These are incorporated as part of a full or partial denture; or, if no teeth are missing, they are supported by a framework that clasps the natural teeth. While the flexible velum is theoretically the best and the patient easily learns to correct his speech with it, it fails because no flexible material is available that will not become foul in the mouth. Soft rubber and the more modern flexible plastics failed. The hinged bulb is used successfully by some dentists (1). The objections to it are that it allows escape of air, its construction is difficult, and it is easily broken. When methyl methacrylate resin and the chromium cobalt alloys became available, the solidly attached bulb came into general use. A bulb can be made from either of these materials: Both are relatively lightweight compared to the previously available vulcanite and gold. If it is desirable that the weight be reduced still further a hollow bulb can be constructed from either methyl methacrylate or the chromium cobalt alloys (2).

Fitz-Gibbon (3) has classified the various types of cleft palate as involving (a) the soft palate only, (b) the hard and soft palate, (c) the hard and soft palate and extending forward through the alveolar ridge and causing a single harelip, and (d) the hard and soft palate and extending through the ridge of each side of the premaxilla causing a double harelip. The first two conditions are most commonly found in the youth and young adult. If the defect was associated with harelip, the lip almost always has been previously repaired.

The prosthodontist will obtain the best results in a patient who has not had surgical interference in an attempt to repair the cleft. For this reason it is important that early cases are given thorough study and consultation to determine the treatment of choice. Surgical at-

<sup>1</sup> Valley Forge General Hospital, Phoenixville, Pa.

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# Cleft Palate Prosthesis

ELLSWORTH K. KELLY, *Lieutenant Colonel DC, U. S. A.*<sup>1</sup>

THE use of artificial material for closing the congenital cleft palate to aid speech and deglutition, dates from ancient times and probably was the first type of oral prosthesis. Many types and forms of obturators have been used in the past, but the restorations now used may be classified as the hinged bulb, the rigidly attached bulb, and the flexible velum. These are incorporated as part of a full or partial denture; or, if no teeth are missing, they are supported by a framework that clasps the natural teeth. While the flexible velum is theoretically the best and the patient easily learns to correct his speech with it, it fails because no flexible material is available that will not become foul in the mouth. Soft rubber and the more modern flexible plastics failed. The hinged bulb is used successfully by some dentists (1). The objections to it are that it allows escape of air, its construction is difficult, and it is easily broken. When methyl methacrylate resin and the chromium cobalt alloys became available, the solidly attached bulb came into general use. A bulb can be made from either of these materials: Both are relatively lightweight compared to the previously available vulcanite and gold. If it is desirable that the weight be reduced still further a hollow bulb can be constructed from either methyl methacrylate or the chromium cobalt alloys (2).

Fitz-Gibbon (3) has classified the various types of cleft palate as involving (a) the soft palate only, (b) the hard and soft palate, (c) the hard and soft palate and extending forward through the alveolar ridge and causing a single harelip, and (d) the hard and soft palate and extending through the ridge of each side of the premaxilla causing a double harelip. The first two conditions are most commonly found in the youth and young adult. If the defect was associated with harelip, the lip almost always has been previously repaired.

The prosthodontist will obtain the best results in a patient who has not had surgical interference in an attempt to repair the cleft. For this reason it is important that early cases are given thorough study and consultation to determine the treatment of choice. Surgical at-

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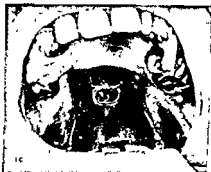


A



B

Figure 1—A, Wide cleft involving soft and hard palate almost as far forward as incisor teeth. Surgical closure had never been attempted. The patient had worn an inadequate device attached to a partial denture. Note crowns and inlays placed to afford adequate occlusal rests. B, Appliance for patient shown in A. C, Appliance in place.



C



A



B

Figure 2.—A, Cleft involving soft palate and hard palate up to height of the vault, a narrower cleft than that shown in figure 1. Surgical closure had never been attempted and the patient had worn a partial denture but not an obturator. B, Appliance for patient shown in A. C, Appliance in place.



C



A



B

Figure 3.—A, Edentulous maxillas with cleft involving soft palate only. The patient had worn a hinge-type obturator that had outlived its usefulness. Satisfactory retention was obtained with the intact hard palate and a solid type obturator proved highly successful. B, Appliance for patient shown in A. C, Appliance in place.



C

tempts at closure when insufficient tissue is available to make a satisfactory repair, often result in a partially closed cleft with scar tissue and loss of tissue tone making further closure with a prosthesis impracticable. On the other hand, if the cleft is amenable to repair, surgical correction is far more satisfactory to the patient than prosthetic correction. In a few special clinics where the services of surgeons, orthodontists, prosthodontists, and speech specialists are available, the treatment is determined after consultation and study of the patient



A



B

Figure 4.—A, Small perforations of hard palate following gunshot wound. B, Stainless steel hypodermic needles incorporated in the denture so that air can be exchanged between oral and nasal cavities without dislodging it.





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by all concerned. At such clinics the patient gets the treatment most suitable for his condition; treatment is not determined by his fear of surgery, his economic status, or a surgeon's view that operation is the only treatment regardless of the prognosis.

In military practice, despite physical requirements for enlistment, we occasionally encounter a patient who needs prosthetic restoration of a congenital cleft palate. Dependents of military personnel with cleft palate may also be seen.

The following describes the manufacture of a solid obturator attached rigidly to the partial or full denture after the manner of Fitz-Gibbon (3) and Bucknam (4). Such an obturator is the simplest and most durable and it will give satisfactory results in closing the cleft. The obturator must have a rigid and highly retentive denture for attachment. The denture, if it is partial, should be well supported with adequate occlusal rests. If anterior teeth (cuspids or incisors) must be used for abutments, three-quarter crowns or inlays must be placed to afford deep rests for the clasps which direct the stress in the direction of the long-axis of these teeth. Three-quarter crowns were used for this purpose in the patient shown in figure 1, and inlays were used to afford positive rests in the cuspids in the patient shown in figure 2. The edentulous patient is the most difficult to treat. Since the patient shown in figure 3 had a cleft of the soft palate only, an adequate posterior seal could be obtained and retention was no problem. Figure 4 illustrates an acquired cleft following a gunshot wound and is included to show how retention can be obtained in a patient with a large opening in the hard palate but with a patent soft palate. Many congenital cleft palates present a similar problem when repair is attempted, and a closure of the posterior portion of the cleft leaves a large opening in the hard palate. A 19-gage stainless steel hypodermic needle was incorporated in the acrylic during processing so that its lumen formed a small communication between the oral and nasal cavities. In this way the denture retained its peripheral seal and since the obturator formed a seal around the perforation, the denture had good retention. Otherwise the difference in air pressure between the nasal and oral cavities created when the patient smokes, swallows, blows his nose, or coughs, will dislodge the denture no matter how well it is adapted.

The soft palate remaining on each side of the congenital cleft is usually movable and easily displaced, which makes impracticable the construction of the obturator on the model at the same time that the denture is processed. Furthermore, the shape of the sides of the obturator and the posterior border must be determined by the movements of the palatal and pharyngeal muscles. For these reasons, the obturator is constructed by (a) forming it in wax on the finished denture, (b) repeated corrections of its shape by frequent trials in the



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The patient with a cleft palate presents an opportunity for the prosthodontist to render a gratifying service. In the Army a patient with this condition will be a young adult, and his age, together with the fact that an operation in the service would render his congenital defect "service connected" makes him a candidate for an obturator rather than operative repair.

#### REFERENCES

1. OLINGER, N. A. Prosthetic restoration of congenital cleft palate. *Am J Orthodontics* 32: 456-468, July 1946
2. CANTOR, B. B. Cleft palate prosthesis; treatment of case with hollowball obturator. *Am J Orthodontics* 31: 740-743, Dec 1945
3. FRITZ-GIMMON, J. J. Cleft palate. *Dental Digest* 40: 262-267, Aug 1934
4. BUCHNAM, L. S. Prosthetics Department, Tufts Dental School, Boston, personal communication
5. BLOCKER, T. G., JR., and BLOCKER, V. Speech training for cleft palate children. The University of Texas Press, Austin, Tex., 1948



### Ulcer<sup>1</sup>

We know very little about ulcer, it would be foolhardy to deny it. The intricate interdependent relationships of the digestive glands and their secretions are not fully understood. Moreover, the agencies which influence the vulnerability of the gastric and juxtagastric mucosal surfaces to injury by acid-peptic juice—either directly or reflexly, are demanding a more intense study and clarification. That emotional urges, whether under or beyond the control of the will, may affect the susceptibility of the juxtagastric mucosal surfaces to injury by acid-peptic juice is understandable. That the behavior of emotional urges which affect unfavorably the relationship between vulnerability to acid-peptic digestion and the interaction, quantity, quality, and the time factor in the delivery—that patients who have ulcer may learn to govern these complex relationships and thus thwart the ulcer diathesis is as absurd as to believe that we can guide the movements of the stars by thinking that we can. Our objective should be to try to understand better than we do, by persistent observations, study, and inquiry, these complex interrelationships. The medical management of ulcer is sound, but its scope is limited by our very inability to accomplish consistently what we set out to do.

<sup>1</sup> WANGENSTEIN, O. H. Role of surgeon in management of peptic ulcer. *Wisconsin M J* 43: 915-919, Oct 1949





equipment and in emergency procedures which may be required at great altitudes. The actual physical effects of explosive decompression are demonstrated in the low-pressure chambers and students are drilled in effective instant use of their personal oxygen equipment.

The entire physiological training program is designed to familiarize flying personnel with all the possible adverse effects to be encountered in modern military aviation and to prepare them to successfully meet these stresses and/or emergencies when they arise. The airman must be capable of recognizing emergency situations early and he must know how to make prompt and effective use of counter-measures, and personal and survival equipment. This knowledge is essential to a continued and effective program of flying safety.

The necessity for adequate aircrew training in the use of oxygen and survival equipment has been emphasized by combat commanders and flight surgeons. Now with the development of high altitude flight at supersonic speeds such training is absolutely essential. For example, the advent of pressurized cabins in aircraft is making flights to 40,000 to 50,000 feet, or higher, a commonplace occurrence. If this artificial pressurized medium were to be suddenly lost at an altitude of 60,000 feet, either by a mechanical failure or by gunfire or flak from hostile forces, the aircrew would be subject to certain death unless protected by additional items of personal clothing or equipment. These essential, life-saving items have been developed and are fast being made available.

There are five important physical problems involved in stratospheric flights at supersonic speed.

The first and most important problem is that of hypoxia. This is closely related to a second problem, that of the escape of dissolved gases from the blood and tissues, which brings on altitude or decompression sickness (bends).

These first two conditions are related to the earth's atmosphere. The air we breathe is composed roughly of one-fifth oxygen and four-fifths nitrogen. This oxygen-nitrogen ratio in the air remains constant as we ascend toward the stratosphere but the barometric pressure decreases. At sea level the atmospheric pressure is 760 millimeters of mercury or 14.69 pounds per square inch at an outside temperature of about 60° F. At 30,000 feet barometric pressure drops to 225.6 millimeters of mercury or 4.36 pounds per square inch and the temperature drops to 48° below zero. At 60,000 feet the pressure has dropped to 54.15 millimeters of mercury or 1.05 pounds per square inch, and the temperature drops to 67° below zero.

At 60,000 feet the oxygen-nitrogen ratio of the air is unaltered but the barometric pressure is then insufficient to permit oxygenation of the blood stream with this rarefied air in the lungs. As a matter of



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fact, during exposure to such rarefied air, oxygen passes from the blood stream into the alveoli and out into the air. This occurs so rapidly that the blood literally boils.

Because of the increasing rarity of the atmosphere at increasing altitudes it has been found that the average individual without supplemental oxygen will lose consciousness in 15 minutes at 20,000 feet, in 1 minute at 30,000 feet, in 20 seconds at 45,000 feet, and in 10 to 15 seconds at 50,000 feet. Forty thousand feet is considered man's oxygen ceiling, because breathing 100 percent oxygen at this altitude is equivalent to breathing ordinary air (20 percent oxygen) at 10,000 feet. Above 40,000 feet man must breathe 100 percent oxygen under pressure to compensate for the decrease in atmospheric pressure to about one-seventh of that at sea level. The Air Force requires all aircrew members to wear oxygen masks when flying above 10,000 feet for it is at and above this altitude that the deleterious effects of hypoxia become manifest. Continued and progressively severe hypoxia leads to unconsciousness and death. With cabin pressurization, and when a differential of 7.45 pounds per square inch is maintained, it is possible to fly at 40,000 feet with a cabin altitude equivalent to 9,750 feet. In this instance it is not necessary to wear an oxygen mask but one must be readily available in case of failure of pressurization. Decompression sickness (the bends, the chokes, and the creeps, depending upon which organs or tissues of the body are most severely affected) rarely occurs below an altitude of 30,000 feet. Above this altitude the "bends" can rapidly become completely disabling and will result in death if allowed to become progressively severe—but it can be completely relieved by descent to lower altitude.

Cabin or cockpit pressurization also prevents decompression sickness but a pressure suit must be worn if death is to be prevented in case of sudden loss of cabin pressurization when flying at altitudes of 60,000 feet and above. The pressure suit is, in effect, another pressurized cabin which fits closely around the pilot's body. Wearing this suit provides added assurance of safety in event of explosive or sudden decompression of the aircraft cabin.

The third problem of great importance is the extreme cold experienced at high altitudes. Exposure of body surfaces to windblast at temperatures of 50 degrees below zero will result in permanent and irreparable physical damage in a few seconds. Specially designed goggles, face masks, gloves, suits, and shoes have been developed to minimize this danger of frostbite. Some lightweight garments are completely heated by electricity.

A fourth problem is that of the expansion of body gases, under conditions of low atmospheric pressure. This will result in intestinal cramps, Barotalgia, and aerosinusitis. Gases normally found in intes-

times will expand to seven times their volume at 40,000 feet. The pain resulting from gases trapped in defective tooth fillings or intestines becomes excruciating and in many instances has resulted in abortion of air missions through incapacitation of crew members.

Emphasis must also be placed on the importance of proper dietary habits, care of teeth, care of upper respiratory infections, and on a method of clearing the ear by carrying out a maneuver similar to Valsalva's test (closing mouth, holding nose, and blowing or swallowing).

All pilots are now given a course of physiological indoctrination during the advanced phases of their flying training.

The fifth problem is concerned with flight at supersonic speeds and is that of centrifugal force which, when applied to the body in increasing intensity, results in conditions referred to as "gray-out," "black-out," or results in unconsciousness. A man weighing 150 pounds at sea level is constantly exposed to the natural forces of gravity, referred to a force of 1 "G." During a high speed inside turn the centrifugal force may be increased to 7 G's, for example, at which time he would then be exerting a bodily pressure on his aircraft seat of seven times his weight of 150 pounds, or a total of 1,050 pounds. Similarly, the body weighs seven times its normal weight, and pooling of the blood will occur in the larger arteries and veins of the abdomen resulting in low cardiac output and cerebral anemia which leads to symptoms of gray-out, then black-out, and finally unconsciousness. When the average pilot is exposed for a period of from 15 to 20 seconds to a force of 4.2 G's he experiences gray-out, at 4.5 G's, black-out, and at 5 G's unconsciousness occurs. Frequent exposures to high G forces results in intense physical and mental fatigue. The duration of exposure to high G forces is very important: the pilot in an upright position can withstand a force as high as 10 positive G for 1 or 2 seconds.

Personnel of the Air Force Medical Service, working closely with engineers, have developed items of equipment and established procedures and techniques which protect airmen from the deleterious effects of exposure to low atmospheric pressure and low temperatures at high altitudes. The Aeromedical Laboratory at Wright-Patterson Air Force Base, Dayton, Ohio, and the Air Force School of Aviation Medicine at Randolph Air Force Base, Tex., are engaged in constant study and research on these problems.







Figure 1.—Atrophy of subcutaneous fat caused by insulin injection

of an Arthus phenomenon since the characteristic changes might be found if serial sections of repeated specimens were examined

This dermatosis occurs most commonly in women and children, and is seldom seen in the adult man. Insulin is not the only substance which produces fat atrophy, since it has been reported following the repeated injection of pollen (6) and pituitary extracts (7). The atrophy usually appears in about 6 months to 2 years after the injection of insulin or other solutions is begun (3).

According to Marble and Smith (3) patients with this condition have a significantly higher incidence of allergic disease (asthma, hay fever, eczema, and urticaria). Atrophy may occur at one site of injection but not at another in the same patient (8). It may occur at sites remote from the injection (7). There are no subjective symptoms accompanying the development of this change; in fact, many diabetics tend to use the same area over and over again since they find that such a site becomes analgesic (2).

Many theories have been advanced to explain the pathogenesis of this type of atrophy. Depisch, in his original paper, thought that it was caused by local injury to nerve fibers. Priesel and Wagner (9) believed that the tricresol used in preserving insulin was the cause, but Depisch gave daily injections of tricresol solution for over 2 months without producing any change. Avery (10) thought that repeated trauma probably damaged the delicate protoplasmic cell envelopes of the fat cells releasing the fat and eventually leading to the formation of scar tissue. Fischer (5) stated that a low grade inflammatory process set up by repeated injection caused a disappearance of the soft areolar tissue and replacement with scar tissue. Biopsy does

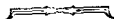
hemorrhagic necrotic changes which one should see in such a reaction, since the specimens were taken from sites where the atrophy had already appeared. It was believed that a specimen taken early before atrophy became clinically evident might show the histologic changes of an Arthus phenomenon. Accordingly a specimen was taken from the left arm at the site of the injection after 2 months of insulin therapy, but there was no clinical evidence of fat atrophy in this region at that time. The section showed no evidence of such reaction, and was reported by Dr Weidman as showing rather localized lymphocytic infiltration, very little edema, no eosinophilia, and no capillary hyperplasia or congestion. However, a single examination does not necessarily disprove the theory

not confirm this as there are no lymphocytic foci indicative of inflammation that one sees for example in specimens taken from depressed areas in narcotic addicts (11). The repeated injections of narcotics produces fibrous changes in the dermis. Since both insulin and lipase come from the pancreas, lipase in the insulin was thought for a while to be the cause of the atrophy. Rabinowitch (12) was unable to find any lipase in concentrations of large volumes of insulin. Nicholas (13) believed that the strong concentration of insulin near the site of injection caused a local oxidation of carbohydrate which in turn resulted in combustion of fat. This fails to explain the occurrence of fat atrophy at remote sites.

Biopsy reports by several investigators all agree that the essential change is a simple disappearance of fat cells without any appreciable reaction. Sometimes there is a slight increase in fibrosis but the overlying epithelium is undisturbed.

#### REFERENCES

1. DEPISCH, F : Über lokale Lipodystrophie bei lange Zeit mit Insulin behandelten Fällen von Diabetes. *Klin. Wchnschr.* 5: 1965-1966, Oct. 15 1926
2. FERGUSON, E. A., and ALPERT, B. : Local lipid atrophy and lipid dystrophy : advantages of limiting sites of injections. *Endocrinology* 24: 741-743, May 1929.
3. MARBLE, A., and SMITH, R. N. : Atrophy of subcutaneous fat following injections of insulin. *Proc. Am. Diabetes A.* 2: 171-186, 1942.
4. BLOTNER, H. : Fatty atrophy following insulin injection in nondiabetic malnutrition. *Endocrinology* 23: 223-226, Aug 1938.
5. FISCHER, A. E. : Frequency of atrophy of subcutaneous fat following injection of insulin. *Am. J. Dis. Child.* 38: 715-720, Oct. 1929
6. FRANCIS, N. : Localized atrophy of subcutaneous fat after repeated injections of grass pollen. *Ann. Allergy* 2: 344-345, July-Aug 1944.
7. FEIL, W : Insulin atrophy of subcutaneous tissue. *Arch. Dermat. & Syph.* 37: 534-535, March 1928.
8. SPIEGELMAN, A. R. : Selective localization of insulin atrophy. *New York State J. Med* 44: 2723, Dec. 15, 1944.
9. PRIESFL, R., and WAGNER, R. : Über lokale Lipodystrophie nach Insulin injectionen. *Ztschr. f. Kinderh* 46: 453-456, 1928
10. AVREY, H : Insulin fat atrophy a traumatic atrophic panniculitis. *Brit. M. J.* 1: 597-599, March 30, 1929
11. MENTZER, S. H., and DUBRAY, E. S. : Fatty atrophy from injections of insulin. *California & West. Med.* 26: 212, Feb 1927.
12. RABINOWITCH, I. M. : Case of extensive atrophy of subcutaneous fat following injections of insulin. *Canad. M. A. J.* 21: 67-68, July 1929.
13. NICHOLS, J. B. : Atrophy of subcutaneous fat associated with insulin injections. *Am. J. M., Sc.* 150: 90-95, July 1929





# Morphine Withdrawal

## Report of a Case

CHARLES T. BROWN, Major, MC, U. S. A.<sup>1</sup>

**A**LTHOUGH morphine addiction as a primary cause for admission to an Army hospital is rare, a patient is occasionally seen who has both a psychologic and physiologic dependency on morphine or some other narcotic because of a painful, chronic disease. In such an instance, the time usually comes when the patient is free of pain, and except for the ordeal of the abstinence syndrome would be eager to free himself of addiction.

The case report that follows illustrates a method by which a patient may be rapidly relieved of addiction to morphine with a minimum of discomfort through the use of Methadon (6-dimethyl-amino-4, 4-diphenyl-3-heptanone hydrochloride). This drug was developed by the Department of Commerce, and intensive research at the Public Health Service Hospital at Lexington, Ky., has demonstrated its effectiveness in the treatment of morphine addiction. There, it has been demonstrated that Methadon is specific for the morphine abstinence syndrome. That the drug might be useful in the withdrawal of other narcotics having a morphinelike action is a rational conclusion. Although Methadon also has definite addiction liability, the abstinence syndrome induced by its continued use is of less intensity than that produced by the withdrawal of morphine. Prior to the introduction of Methadon, almost every known drug was used in an attempt to carry the addict through the agonizing misery of the abstinence syndrome. In this new drug, we have the most effective substitutive therapeutic agent yet employed.

### CASE REPORT

A 60-year-old man who had been taking morphine continuously for 41 years was admitted to the neuropsychiatric service. He had initially been admitted to the tuberculosis service, where it was determined that he had advanced pulmonary tuberculosis with extensive cavitation. On being informed of the nature of his disease, he expressed a desire to be relieved of his addiction to

<sup>1</sup> Neuropsychiatric Service, Fitzsimons General Hospital, Denver, Colo.

every 4 hours for 3 days. The Methadon and morphine were given in 1 cc. syringes. On the sixth day, morphine was discontinued, and the patient was given 20 mg. of Methadon every 4 hours. This was continued until the tenth day, when the dose of Methadon was reduced to 15 mg. every 4 hours. For the next 3 days the dose was reduced each day until on the twelfth day he was receiving only 5 mg. of Methadon at each injection. The drug was then discontinued and for 3 succeeding days, he received injections of sterile water at his accustomed hour of medication. In the last 2 days of his withdrawal period, the cumulative effects of the Methadon gradually subsided, and the patient became restless. At no time, however, did he complain of any discomfort, and he proved most cooperative throughout the period of treatment. For insomnia of which he complained for a few nights after the discontinuance of the Methadon, he was given 13 gm. of chloral hydrate at bedtime. This was repeated during the night if necessary.

On the twenty-first day following the beginning of withdrawal, he was transferred back to the tuberculosis service for further observation. He was followed daily after his transfer, and aside from minor complaints of restlessness and general weakness, he exhibited no discomfort. He at no time asked for any type of medication, and stated that he no longer felt the desire for morphine. He was discharged after 2 months of hospitalization at his own request in order that he might return home to settle some business affairs. Three months following his discharge from this hospital, he stated in a personal communication that he felt fairly well and had no desire to resume the use of narcotics.

#### DISCUSSION

The most important factor in the withdrawal of a narcotic from an addict is the physician-patient relationship. No physician, other than the one undertaking the withdrawal, should participate in the treatment except in an emergency. The nurses and attendants must be especially instructed in regard to the treatment. Most past failures

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### CASE REPORT

A 60-year-old man who had been taking morphine continuously for 41 years was admitted to the neuropsychiatric service. He had initially been admitted to the tuberculosis service, where it was determined that he had advanced pulmonary tuberculosis with extensive cavitation. On being informed of the nature of his disease, he expressed a desire to be relieved of his addiction to

<sup>1</sup> Neuropsychiatric Service, Fitzsimons General Hospital, Denver, Colo.

Then Methadon 20 mg. along with 16 mg. of morphine sulphate every 4 hours for 3 days. The Methadon and morphine were given in 1 cc. syringes. On the sixth day, morphine was discontinued, and the patient was given 20 mg. of Methadon every 4 hours. This was continued until the ninth day, when the dose of Methadon was reduced to 15 mg. every 4 hours. For the next 3 days the dose was reduced each day until on the twelfth day, he was receiving only 5 mg. of Methadon at each injection. The drug was then discontinued and for 3 succeeding days, he received injections of sterile water at his accustomed hour of medication. In the last 2 days of his withdrawal period, the cumulative effects of the Methadon gradually subsided, and the patient became restless. At no time, however, did he complain of any discomfort, and he proved most cooperative throughout the period of treatment. For insomnia, of which he complained for a few nights after the discontinuance of the Methadon, he was given 13 gm. of chloral hydrate at bedtime. This was repeated during the night if necessary.

On the twenty-first day following the beginning of withdrawal, he was transferred back to the tuberculosis service for further observation. He was followed daily after his transfer, and aside from minor complaints of restlessness and general weakness, he exhibited no discomfort. He at no time asked for any type of medication, and stated that he no longer felt the desire for morphine. He was discharged after 2 months of hospitalization at his own request in order that he might return home to settle some business affairs. Three months following his discharge from this hospital, he stated in a personal communication that he felt fairly well and had no desire to resume the use of narcotics.

#### DISCUSSION

The most important factor in the withdrawal of a narcotic from an addict is the physician-patient relationship. No physician, other than the one undertaking the withdrawal, should participate in the treatment except in an emergency. The nurses and attendants must be especially instructed in regard to the treatment. Most past failures

# Thiomerin

## A Mercurial Diuretic for Subcutaneous Administration

DALLAS E. BRUNMAN, *Lieutenant Junior Grade (MC) U. S. N.<sup>1</sup>*

HENRY R. COOPER, *Lieutenant (MC) U. S. N.<sup>1</sup>*

RALPH C. PARKER, Jr., *Commander (MC) U. S. N.<sup>1</sup>*

IN THE last 2 years investigations using BAL and related compounds have been reported and have led to modifications of mercurial diuretics. A recently developed compound, Thiomerin (MT6), a mercaptide complex, was studied clinically to test its diuretic effectiveness and to evaluate the claim that it can be safely administered by subcutaneous injection.

### METHOD

Patients in congestive heart failure were picked at random for the study. Thiomerin in doses of 1 or 2 cc. was administered subcutaneously; in addition, a low sodium diet, ammonium chloride and an unrestricted fluid intake was prescribed. If taking digitalis on admission, a maintenance dosage was continued, but no digitalization was begun while the patients were receiving Thiomerin. Weight change on this regime was used as objective evidence of the effectiveness of the treatment.

### RESULTS

Forty-one subcutaneous injections of 1 cc. each were given the average weight loss within 24 to 48 hours was 3.5 pounds per injection. Forty-nine 2 cc. subcutaneous injections resulted in an average weight loss of 4.4 pounds within 24 to 48 hours following each injection. No weight change was noted with five injections and there was an average weight gain of 0.33 pound per injection in seven instances. No general toxicity was noted in this series. Three injections resulted in minor local reactions, consisting of tenderness and slight erythema, together with minimal induration in one case. All evidence of local irritation disappeared within 24 to 48 hours.

<sup>1</sup> U. S. Naval Hospital, Bethesda, Md.

In 1947 Lehman (4) demonstrated that the general toxicity, as reflected in electrocardiographic changes of mercuric chloride, Salyrgan-theophylline, Mercuzanthin, Mercurhydrin, and MF6 (the disodium salt of N ( $\gamma$ -carboxymethylmercaptomercuri-B methoxy) propyl camphoramic acid) decreased in the order named. The latter preparation produced no electrocardiographic changes in doses 160 times the maximum tolerated dose of Mercurhydrin and 400 times the maximum tolerated dose of mercuric chloride. The decrease in the toxicity of this new mercurial compound is thought to be due to the relatively greater stability of this mercaptide as compared with the theophylline complex (4). The development of a mercurial diuretic in the mercaptide form occurred in the following manner:

Experimental work has shown that some mercurial compounds and trivalent arsenicals inactivate certain enzymes which contain sulfhydryl groups (8). The combination of the mercurials and the sulfhydryl radicals apparently forms a stable mercaptide which prevents the action of the enzyme. It is believed that mercurial diuretics inactivate specific enzymes of the renal tubules and thus prevent the reabsorption of sodium, thereby bringing about a sodium and water diuresis (5). Reaser and Burch (6) in studies utilizing radioactive  $\text{Na}^{22}$ , have shown that a sodium diuresis precedes the water diuresis by 2 to 4 hours after the administration of a mercurial diuretic.

The discovery that the di-thiol compound, BAL, prevented the diuresis caused by mercurial diuretics opened a new line of investiga-

tion (8) BAL supposedly forms a stable mercaptide with mercurials and thus prevents the toxic effects of mercury ions, or the inactivation of certain enzymes as indicated above. It has been demonstrated that the mono-thiol compounds, thioglycollic acid and glutathione, will also inhibit the diuretic effect of mercurials but in much larger doses than the di-thiol compound BAL (8).

It is recognized that sudden deaths resulting from the intravenous injection of mercury compounds are due to their cardiotoxic effects. By using the electrocardiograph, Lehman (4) measured the cardiotoxic effect of several mercury compounds as listed above. The most significant electrocardiographic changes consisted of abnormalities of conduction, widening of the QRS complex, was a consistent measure of toxicity. It was adequately demonstrated that the mercaptide MT6 formed by combining an organic mercurial, N( $\gamma$ -hydroxymercuri-B-methoxy) propyl camphoramic acid, with an aqueous solution of sodium thioglycollate, was distinctly less toxic than mercuric chloride or the mercury-xanthine compounds.

A further step toward a better mercurial diuretic was the demonstration by Farah and Maresh (5) that in contrast with di-thiol BAL, the monothiols, cysteine, and glutathione, in doses fully active against the cardiotoxic effects of Mer-salyl, did not decrease the diuretic effect of this mercurial. Thus, the development of the theoretically ideal mercurial diuretic appeared to be closely approached by the combination of an organic mercurial with one of the mono-thiols, thereby preventing the cardiotoxic effects while preserving the diuretic action.

It has been previously shown that the combination of a mercurial and theophylline decreased the local irritative effects of the diuretic (11)—however, not to the extent that it could be generally administered by the subcutaneous route. As the mercaptide form is much more stable than the theophylline complex, it is to be expected that the new mercurial compound MT6 would have less local toxicity than those mercury-xanthine compounds now in general use. That this is true is attested by the work of Borg and Craig (9) and the present brief clinical series. The mercaptide, Thiomerin (MT6), is an effective mercurial diuretic and can be used in adequate clinical doses by subcutaneous injection. The desirability of this manner of using a mercurial diuretic is obvious; for example, a patient who is on a maintenance biweekly or weekly dose may use it himself in the fashion that the diabetic uses his insulin. The injection, of course, should not be given in an endematous area.

#### SUMMARY

A short clinical series is presented showing the effect of the new mercaptide diuretic Thiomerin (MT6) given by subcutaneous in-





# Planning, Organization, and Administration of a Large Dental Prosthetic Activity During War-time

ALVIN H. GRISWOLD, *Commander (DC) U. S. N.*

**T**HIS report outlines the work load, personnel, facilities, treatment plan, and procedures necessary for setting up and operating a large dental prosthetic activity during wartime and also reflects the policy of providing the greatest good for the greatest number rather than the highest degree of excellence for a chosen few.

This report is based principally upon experience gained in the planning, construction, organization, and administration of the prosthetic department at one of the Navy's largest training centers (Great Lakes, Ill.) during World War II. It is felt that the basic information developed through that experience should be of value to anyone having a similar assignment in the future and therefore should be made available to others. Examples of survey findings and of procedures developed at that activity are included.

## WORK LOAD

The first thing to be determined in planning a prosthetic activity is the work load. This can be found by determining the number of recruits to be inducted at the activity and the number and types of prosthetic restorations that will be required.

*Prosthetic requirements of recruits.*—The shortage of facilities at times necessitated limiting prosthetic treatment to those recruits who had less than the equivalent of three bicuspids in occlusion. Using this as a basis, it was found that the following percentages of all recruits inducted required treatment during a 12-month period in 1943 and 1944.

Month:	Percent	Month:	Percent
August.....	4.9	February.....	7.3
September.....	6.9	March.....	7.3
October.....	6.2	April.....	7.3
November.....	6.9	May.....	6.9
December.....	8.5	June.....	5.2
January.....	8.8	July.....	5.4

Age:	Percent	Age:	Percent	Age:	Percent
17-----	0.05	27-----	4.00	37-----	7.48
18-----	4.38	28-----	4.13	38-----	8.88
19-----	16.43	29-----	4.55	39-----	9.60
20-----	3.95	30-----	5.80	40-----	0.04
21-----	1.90	31-----	5.48	41-----	0.05
22-----	1.90	32-----	4.98	42-----	0.08
23-----	2.08	33-----	5.65	43-----	0.05
24-----	2.10	34-----	5.15	44-----	0.05
25-----	3.18	35-----	4.95		
26-----	3.93	36-----	4.98		

The average number of dentures required was 1.6 per man.

The distribution of the various types of treatment required was:

Types:	Percent	Types:	Percent
Full upper dentures-----	31.3	Partial lower dentures--	31.8
Full lower dentures-----	11.5	Miscellaneous-----	1.4
Partial upper dentures-----	24.0		

Most patients required a combination of upper and lower dentures. The distribution of dentures, by patients, was as follows.

Denture combinations:	Percent of Patients
Single full upper cases-----	11.6
Single full lower cases-----	.5
Full upper and full lower dentures-----	18.0
Full upper and partial lower dentures-----	21.5
Full lower and partial upper dentures-----	.3
Single partial upper dentures-----	17.8
Single partial lower dentures-----	9.3
Partial upper and partial lower dentures-----	21.0

*Prosthetic requirements of station personnel.*—The prosthetic requirements of personnel assigned to the station for duty can be disregarded in determining the facilities needed. These are nominal compared to those of the recruits, and can easily be met during slack periods in induction.

*Preprosthetic requirements—Oral surgery.*—Recruits in need of prosthetic treatment required an average of 9 extractions per man. Conservative surgical preparation of the mouth was performed routinely; in addition to this preparation and extractions the amount of minor oral surgery was nominal.

*Preprosthetic requirements—Operative.*—It was found that of those recruits requiring some form of partial prosthesis, an average of 7 out of 10 recruits (70.8 percent) required operative treatment. These latter patients required an average of 10 restorations per man, mostly two-surface or larger.

The oral surgical and operative requirements also varied with the area from which recruits were inducted, and were the highest in recruits from the eastern section of the country.

### PERSONNEL

After making an estimate of the work load, the next thing to be considered is the number of dental officers and corpsmen needed in the entire prosthetic set-up, including the oral surgery and operative clinics assigned to do the necessary preprosthetic treatment.

The personnel requirements of the prosthetic department proper should be divided into those of the (a) clinic, (b) laboratory, and (c) administrative sections.

(a) *Clinic personnel required:* The number of dental officers required in the clinic section depends upon the prosthetic techniques to be employed and the capabilities of the dental officers. A dental officer previously engaged in the general practice of dentistry, and possessing a fair degree of knowledge and experience in prosthetics, can complete from six to eight dentures per day, provided that not over half of these are full dentures and that all laboratory procedures are completed for him in a satisfactory manner within a specified time.

It is further essential that (a) the simplest techniques commensurate

dental officer in the clinic section.

(b) *Laboratory personnel required:* The personnel required in each section for a prosthetic laboratory designed to complete work for a company of 120 men (up to 200 dentures) per day was as follows (the average technician working under Service wartime conditions is approximately one-half as efficient as the average technician working in a civilian laboratory):

At sit-down benches (by procedure) :	Number of men
Baseplates, occlusal rims, and wax for trial set-ups.....	9
Bent wire skeletons.....	18
Gold castings (and bent wire skeleton when required).....	3
Set-up for full and partial dentures.....	18
Relief outline and postdam.....	1
Tinfoil.....	6
Special acrylic resin work.....	3
Wax and rough finish.....	24
Repairs.....	2
	<hr/>
	84
	<hr/>

At stand-up benches (by procedure) :	
Plaster bench (fix alginate impressions; pour; separate and trim models; mount on articulator).....	11
Invest, boil out sticky wax, and preheat partial skeletons for soldering.....	2
Occlusal matrix and flasking.....	6
Wax boil-out.....	2
Acrylic packing.....	4
Acrylic curing.....	1
Deflasking.....	4
Polishing.....	8
Flask, tray, and articulator clean-up.....	2
	<hr/>
	40
	<hr/>

Laboratory supervision and administration (by duty)	Number (of men)
Case recorders.....	2
Laboratory stockroom.....	1
Tooth and gold issue.....	1
Chief supervisor.....	1
Bent-wire supervisor.....	1
Setup supervisor.....	1
Wax, rough-finish, and polish supervisor.....	1
	<hr/>
	8
	<hr/>
Total technicians.....	132
Dental officers in laboratory:	
Officer in charge.....	1
Dental officer—assistant.....	1
	<hr/>
Total officers.....	2

The number of men assigned to each section of a prosthetic laboratory will vary with the ability of the technicians employed, the clinic and laboratory techniques adopted, and the percentage of full dentures

each recruit during his period of training, regardless of how short the training period may be. Should that be the case, it may be impossible to accomplish the necessary operative treatment and extractions in time to allow sufficient healing so that suitable prosthetic treatment can be rendered during the regular training period. Another undesirable situation exists when prosthodontia patients are scattered throughout the companies in the training center. Where such is the case, training "musts" will interfere with the ability to provide special diet and treatments for patients; and the greatly increased dental clerical work required to keep track of the treatment for each recruit will become an insurmountable obstacle to the efficient administration of the prosthetic activity.

Under the previously mentioned circumstances it will be impossible to provide prosthetic restorations of the desired quality in the time allowed. Any attempt to transfer incompleated cases to companies graduating at a later date will result in the retention of an unpermissible number of recruits in training status.

The most satisfactory way to overcome all these obstacles and yet provide suitable prosthetic treatment is to (a) place all recruits in need of such treatment in special dental companies immediately upon induction; (b) stabilize the training period of such companies at a minimum of 8 weeks; (c) barrack all dental companies in the same regiment, in the area in which the prosthetic facility is located; (d) maintain by companies a record of all treatment required and completed; (e) schedule all treatment under a treatment coordinator; and (f) eliminate any conflict between training "musts" and required dental appointments through cooperation with the recruit training officer.

*Original examinations.*—It is assumed that in every large training center facilities will be provided for physical examination of all new recruits before they are assigned to a company for training. Dental officers conducting routine dental examinations of new recruits should be instructed to have all those who may require prosthesis reexamined by a prosthetic dental officer who will (a) definitely determine the need for prosthesis; (b) record the types of prostheses required; (c) assure that recruits in need of prostheses are placed in dental companies; and (d) send a list of all recruits assigned to a given dental company with the number and types of prostheses required, to a treatment coordinator in the main prosthetic facility.

*Treatment coordinator.*—A treatment coordinator is necessary to assure (a) that all the oral surgery and operative treatment required by a company is completed as soon as possible, and by a definite specified time to permit maximum healing; (b) that all prosthetic treatment is completed sufficiently in advance of the graduation date to permit

two adjustments on each restoration; and (c) that training periods and dental appointments of recruits do not conflict. The established deadline by which all oral surgery had to be completed at the U. S. Naval Training Center, Great Lakes, Ill., was the fifth day after a company formation; the training period for dental companies was 8 weeks.

Before the treatment coordinator can accomplish these objectives, he must have an accurate record of the amount of various types of treatment necessary, and accordingly appoint recruits for that treatment. This cannot be done without a more accurate determination of the treatment requirements than is possible in the limited time allowed during the screening examinations. Therefore, the treatment coordinator must see that each company is reappointed as soon as possible for a thorough examination and final diagnosis.

*Final diagnosis.*—The entire dental company is reexamined, and a careful and as nearly final diagnosis as possible is made. To accomplish this (a) X-rays are taken whenever indicated; (b) questionable cavities are excavated to determine whether extraction is required, since the type of prosthetic treatment rendered may depend upon whether questionable teeth have to be extracted; and (c) a record of all extractions, surgical preparations, restorations, and the number and types of prosthetic replacements for each patient is forwarded to the treatment coordinator.

After the treatment requirements for a company have been determined, the treatment coordinator will advise each department of the amount of work to be accomplished and will work out a schedule of appointments with the head of each department and with the recruit training officer to assure that it is accomplished according to a set schedule.

*Oral surgery.*—A separate oral surgery department with a dental sick bay should be provided to treat men in dental companies; this *must* be under the direct control of the officer in charge of the prosthetic activity. This will (a) permit understanding and cooperation between the oral surgeon and the prosthodontist which is essential to good dentistry; (b) permit the prosthetic department to follow through on the diagnosis for prosthetic treatment without changes being made by oral surgeons unfamiliar with the requirements of prosthetic dentistry; (c) allow the prosthetic department control over oral surgical preparation and surgical procedures; and (d) permit the best possible cooperation with the prosthetic department in determining the desirability of rendering periodontia treatment, especially where teeth intended for abutments are concerned.

*Operative dentistry.*—A separate operative dentistry department should also be provided as a part of the prosthetic activity to assure that (a) the prosthetic department obtains the type of restorations

training in others, a study was made of the T/O and E's and T/D's of all units and installations where Medical Service Corps officers are used and total requirements for each MOS were formulated. A file of all Medical Service Corps officers by MOS was set up as an inventory of the specialists on hand. This included a ledger similar to that previously described for medical officers. Career cards have been prepared for all Regular Army Medical Service Corps officers and are kept current.

To define more clearly the extent of training of officers in each type of specialty, eight new MOS's were prepared to cover the medical supply field. Alphabetical prefixes were prepared and submitted for publication to make the scientific MOS's more explicit. The letters D, C and B, are awarded for progressive training and experience in the professional field and prefix A goes to officers who have distinguished themselves in the field after training has been completed. New MOS's will be prepared as required.

A basic career pattern has also been developed for the following corps: Dental, Veterinary, Army Nurse, and Women's Medical Specialist. Because of the limitation of these special fields rotation of assignments outside the field is not practicable. During the period of basic training rotation will be within the various types of duties in the field. Subsequent to classification in a specialized area of the field it is planned that an officer's assignments will continue in the area indicated.

In addition to continuing the study of the training and assignment of Medical Department officers as indicated above, it is planned in the next year to put more emphasis on training in military medicine. It is hoped to re-sume giving the basic course in the fall of 1950. This course will be divided into a medical and field phase. The medical phase will be given first to about 25 medical officers at the Army Medical Center, Washington, D. C. The field phase will follow, in January 1951 at the Brooke Army Medical Center, Fort Sam Houston, Tex. In addition to the 25 medical officers it is expected that 10 Dental Corps, 10 Veterinary Corps, and 25 Medical Service Corps officers will take the second phase. It is also expected that several officers of the Medical, Dental, Veterinary, and Medical Service Corps can be made available to take the advanced course at the Medical Field Service School each year from now on.

While the Career Management Program of the Army is designed only for Regular Army officers, in implementing it the Surgeon General is making provision for the maximum development and best use of Reserve officers on active duty. This is particularly true in the case of Medical Service Corps officers where the ratio is three Reserves to each Regular officer and where many of the officers wish to make a

career of the Army. The Career Guidance Section is alert to every possibility for training or experience that will render these officers better qualified for service with the Army.

Another function of the Career Guidance Section is to determine the best potential war assignment for all Regular Army officers of the Medical and Medical Service Corps, and to keep current such records for immediate use. Early in 1947 a file of principal war service administrative positions for Regular Army medical officers was developed. This information has been correlated with the records since the end of the war, with advancement by reason of military training or experience, and with professional training or experience, and a potential war assignment has been designated.

In October 1949 initial mobilization assignments were determined for about 900 Regular Army medical officers and 600 Medical Service Corps officers to fill key administrative and professional positions. These assignments are being reviewed periodically and changes will be made to meet adjustments deemed necessary by reason of promotion or changes in career patterns.





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## The Control of Communicable Diseases

The Control of Communicable Diseases, 7th edition, American Public Health Association, was recently added to the List of Recommended Books for the Army Medical Department. One copy of this handbook will be issued to each medical officer. All installations and headquarters should obtain the necessary number of copies of this book in order that all medical officers may receive their copy at the earliest possible date. Additional copies are recommended for reference in headquarters offices and in medical libraries.

This new edition has been brought up to date by the Subcommittee on Communicable Disease Control of the Committee on Research and Standards of the American Public Health Association. The previous editions have long been accepted as an official statement of acceptable procedure by the Public Health Service. The present edition continues to carry this recognition and in addition has been accepted by several foreign countries. It has been approved in principle by the Surgeons General of the Army, Navy, and Air Force. As such it may be used for definition of accepted communicable disease control procedures where specific instructions are omitted in official Army publications.

Most medical officers believe they thoroughly understand the methods of controlling the spread of disease. Usually, however, when demands are made for this knowledge they find it to be vague and out of date. This fact is not recognized until the officer is suddenly called on to give his recommendations for the control of a disease encountered during military operation in an area foreign to him. When instances of this type occur a reference book is most welcome and often the least accessible. Since *The Control of Communicable Diseases*, is small in size, can be carried anywhere and gives all the salient information required in outline form, it readily fulfills the need in these unusual situations. The medical officer who is conscious of his preventive medicine responsibilities will have occasion to use the book almost daily whether he is assigned to a hospital, staff, or field position.

EDITOR'S NOTE.—The Bureau of Medicine and Surgery will distribute *The Control of Communicable Diseases* to all Medical Corps officers, Medical Service Corps officers, and to all ships and stations of the Navy Department.



THE PHYSICIAN MUST KNOW  
WHAT HIS PREDECESSORS HAVE  
KNOWN IF HE DOES NOT WISH  
TO DECEIVE BOTH HIMSELF AND  
OTHERS —*Hippocrates*.

## EDITORIAL

### Clinical and Laboratory Use of Isotopes

At the present time radioactive isotopes are used to a greater extent in physiologic research than in therapy. The results of the therapeutic application of isotopes have been disappointing.

*Radioactive iodine* ( $_{53}\text{I}^{131}$ ).—Radioactive isotopes of iodine are of value in the treatment of hyperthyroidism. About 80 percent of the patients with thyroids 60 to 75 gm. in size, treated with the appropriate dose of radioactive iodine, have been cured. Myxedema occasionally occurs.

Radioactive iodine is also of value in the relief of pain in angina pectoris and congestive heart failure; by lessening thyroid activity and diminishing the body's demand upon the heart the distress and pain of angina pectoris and the dyspnea of congestive heart failure is alleviated to an extent that enables the patient to resume physical activity.

Carcinoma of the thyroid does not respond to treatment with radioactive iodine because hyperthyroidism is not a clinical feature and the malignant thyroid tissue does not take up radioactive iodine. In only a small percent of carcinomas of the thyroid is the tumor capable of taking up and storing iodine. In some instances the metastatic lesion produces true hyperthyroidism and the uptake of radioactive iodine in such instances is the same as in toxic goiter.

*Radioactive iron* ( $\text{Fe}^{59}$ ).—With the use of this isotope it has been shown that young red cells are more sensitive to hypotonic solutions than are mature red cells; that plasmodia prevails in young red cells; and that Nembutal will drive red blood cells into the spleen and therefore the administration of Nembutal in shock is dangerous. Further, that in the refrigeration of red blood cells, the addition of dextrose to the citrate anticoagulant and the maintenance of a slightly acid reaction of the diluted plasma and an optimal dilution is essential to prolonged preservation of red blood cells. In certain acid citrate solutions whole

## BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor

UNITED STATES ARMED FORCES MEDICAL JOURNAL,

Bureau of Medicine and Surgery, Navy Department,  
Washington 25, D. C.

(For review)

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SENSORY MECHANISMS OF THE RETINA with an appendix on Electroretinography by Ragnar Granit M. D. *Director of the Nobel Institute for Neurophysiology Professor of Neurophysiology The Royal Caroline Institute Stockholm* 412 pages. Illustrated. Oxford University Press, New York, N. Y., publishers, 1947. Price \$11.

This book primarily deals with the transformation of the study of the electrical responses of the eye into a scientific method capable of analyzing the intra-ocular sensory mechanism of the retina. It is divided into four sections: (a) The Electrical Signs of Excitation and Inhibition of the Retina and Optic Nerve; (b) The Properties of Rods and Cones Variations in Area, Intensity and Duration of the Stimulus in Dark and Light Adaptation; (c) The Properties of the Photosensitive Substances and the Mechanism of Excitation; and (d) Colour Reception.

Electrophysiology of the retina dates from the middle of the last century when DuBois Reymond's discovery of the negative variation in nerves and the resting potential of the eye (1849) prompted Holmgren to apply electrodes to the eye. His galvanometer gave a deflection when the eye was illuminated and another when the light was turned off. He thereupon described what is now known as the electroretinogram in a paper published in 1865. Since then knowledge in this field has proceeded hand in hand with electrophysiology in general. The development of valve amplification has enabled electrophysiology to make great strides in the last two decades. The electroretinogram is a composite curve which integrates the complex electrical responses to stimulation in the retina. Granit's great contribution to the physiology of vision has been the revelation of the processes in the retina and optic nerve underlying not only scotopic but also photopic vision. He has shown that the retinogram is the only measurable index of what takes place in the retina in response to changes in illumination. He has found two chief types of electroretinograms: the E-Retinogram which is dominated by rods; and the I-Retinogram which is dominated by cones. His analysis of the electroretinogram is the most complete and best established to date. With his micro-electric technique Granit has fully confirmed the identity of the scotopic sensitivity curve and the visual purple absorption curve with its maximum at  $500\mu$ ; and has shown that the photopic curve corresponds with the photopic luminosity curve with its maximum at  $550\mu$ . These he calls the scotopic and photopic dominator curves. These curves are further analyzed into

a definite number of curves which he calls the modulator curves. The dominator modulator theory shows that the scotopic and photopic curves are true luminosity curves, i. e. brightness differences.

The Appendix I on technical notes and Appendix II on electroretinography in man together with a large and complete reference table makes this a most valuable book for any one interested in neurologic or ophthalmic philology. The format is excellent and the numerous illustrations consisting chiefly of graphs and charts are comprehensive and accompanied by full explanatory notes. The book should be a must for anyone working in electrophysiology and the physiology of vision but in a general medical library it would probably find a very limited use.—*Capt. W. L. Berkley (MC) U. S. N.*

**HANDBOOK OF ORTHOPEDIC SURGERY**, by Alfred Rives Shands, Jr., B. A., M. D., *Medical Director of the Alfred I. duPont Institute of the Nemours Foundation, Wilmington, Del., Visiting Professor of Orthopedic Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pa.*, in collaboration with Richard Beverly Raney, B. A., M. D., *Associate in Orthopedic Surgery, Duke University School of Medicine, Durham, N. C.; Lecturer in Orthopedic Surgery, University of North Carolina School of Medicine, Chapel Hill, N. C.* 3d edition. 574 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$6.

Dr. Shands first introduced this handbook in 1937 and since that time it has become a standard reference in undergraduate orthopedic instruction. It is also widely used by the pediatrician and the general practitioner, which testified to its suitability. In this most recent revision, Dr. Shands and his co-author, Dr. Raney, have added some new material which has evolved from experiences gained in the recent war. The original form and most of the original illustrations are retained.

The book systematically covers the general field of orthopedics, including basic considerations of bone and joint affections, proceeding through the congenital deformities to the affections of growing bone, and of adult bone. The arthritides and neuromuscular disabilities are adequately covered. Several chapters give consideration to the special regions of the musculo-skeletal systems. A brief summation of fractures is given. It is not the intention of this handbook to detail treatment, but merely to call attention to the deformities which may occur from trauma.

This book will continue to serve as an excellent outline for teaching medical undergraduates, nurses, physical therapists, and hospital corpsmen. The excellent bibliography makes it a valuable source book for the orthopedic resident and researcher.—*Commander C. R. Carr (MC) U. S. N.*

**PRACTICE OF ALLERGY**, by Warren T. Vaughan, M. D., *Richmond Va.* Revised by J. Harvey Black, M. D., *Dallas, Tex.* 2d edition. 1,132 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1948. Price \$15.

This detailed second edition of a well-known classic in the field of allergy appears 9 years after the original edition. The death of the original author might have terminated the usefulness of what started as an outstanding text in this field, but fortunately Dr. Black has carried on, adding new knowledge and removing that which is no longer acceptable.

To the student new to this sphere, this volume offers what is too often missing in current texts—a keenly appreciative and revealing historical chapter. To all but those who use a book merely for rapid reference, such an introduction serves a great but intangible purpose in orientation and appreciation. This is followed in natural sequence by detailed chapters on the theories of anaphylaxis, the relation of experimental anaphylaxis and clinical allergy, terminology, and functional pathology. The discussions on the nature of allergy are particularly illuminating. The next step is a consideration in several chapters of the factors of incidence,

environment, heredity, and the growth of the allergic child, followed by three extremely detailed chapters on physiology. The psychological aspects of allergy are well covered.

The authors then move nearer the individual patient with an excellent discussion of the approach to the patient and the history of the patient's illness which is so extremely important in allergic diagnosis. All conceivable means of testing are taken up in several chapters with a very fair consideration of the pros and cons, and of the opinions of others.

Of use to those new to this field are detailed instructions relative to needles, syringes, extracts, and other material.

The rather controversial problems of food allergies are well presented and the approaches of any one authority are not unduly stressed.

Pollens, Polinosis, and other inhalant allergies are introduced by chapters on the development and distribution of pollens, botanical aspects, and surveying methods. There are many good and extremely helpful illustrations of various plants of allergic significance. There are several chapters on various means of treatment reactions and inhalants other than pollen.

Allergies related to bacteria, fungi and animal products are considered with the same detailed approach. Anaphylactic shock, drug allergy, contact allergy, and physical allergy are well outlined. The chapter on the use of drugs in the treatment of allergy is extensive and includes the antihistamines.

The last part of the book is devoted to the various allergic diseases in all their manifestations. A number of diseases which are of doubtful status are considered, however, there is no attempt to overwhelm the reader with arguments in favor of their allergic origin.

The book is well organized and clearly printed. One departure from many medical texts is a listing of references at the end of the book and the lack of reference numbers. While this makes the use of the references somewhat more difficult, it also makes for a more readable and nicer appearing volume—*Commander R. C. Parker, Jr. (MC) U. S. N.*

ORAL AND DENTAL DISEASES, Aetiology Histopathology Clinical Features and Treatment

A Textbook for Dental Students and a Reference Book for Dental and Medical Practitioners by Hubert H. Stones, M.D., M.D.S., F.D.S.R.C.S. (Eng.), Professor of Dental Surgery and Director of Dental Education, University of Liverpool, Hon. Director, Liverpool Dental Hospital, Consultant F.M.S. Maxillofacial Centre, Liverpool. 1964. Pp. 400. 15s. 6d. (Hb.).

Co., Baltimore, Md. publishers 1948. Price \$18

This book is a new publication by a British author. In this voluminous work an attempt has been made to cover etiology, histopathology, clinical features, and treatment of the diseases and injuries of the teeth, their investing tissues, the jaws, and oral mucosa.

The material presented in most chapters is brief. For example, treatment of jaw fractures covers five pages, treatment of impacted third molars covers two pages. Malocclusion of the teeth and maldevelopment of the jaws, usually written as a separate textbook, covers only 45 pages. However, an unusual feature is the comprehensive bibliography at the conclusion of each chapter, which should aid the reader to gather more material. The chapter on stains and discoloration of the teeth is well presented.

The format is good for this type of book. The illustrations are well done, especially those in color.

The author states this book is a *textbook for dental students*. Considering the brief and incomplete information in chapters on etiology of dental caries,

traumatic maxillo-facial injuries, and histopathology and clinical features of dental caries, its use is not recommended in American dental schools—*Commander A. Bartelle (DC) U. S. N.*

**HANDBOOK OF DENTAL PRACTICE** edited by Louis I. Grossman D. D. S., Dr. Med. Dent., with 18 authors. 417 pages, illustrated. J. B. Lippincott, Philadelphia, Pa., publishers, 1948. Price \$12.

This book is intended to serve as a daily guide in dental practice and for handy reference purposes. Concise description of techniques is featured in a number of the chapters, while others are devoted principally to discussions of specialty practice problems or to the classification and treatment of various types of cases. The book is well printed and arranged and is divided into two parts, the first of which includes sections on anesthesia, caries prevention and control, oral diagnosis, and the dental practice specialties except those having to do with restorative treatment. The second part covers dental operative and prosthetic procedures, with a chapter on pedodontics. The illustrations, all in black and white, are generally good. Considering that the 18 authors were allowed only about 22 pages each, the book is not recommended as a substitute for standard texts. A surprising amount of very useful special knowledge, nevertheless, is provided by some of the contributions, notably Dr. J. R. Cameron's tersely informative chapter on exodontics and Dr. V. R. Trajanzano's chapters on partial and complete artificial dentures.—*Capt. H. R. Delancy (DC) U. S. N.*

**HEADACHE AND OTHER HEAD PAIN** by Harold G. Wolff M. D., *Professor of Medicine (Neurology) and Associate Professor of Psychiatry, Cornell University Medical College, Attending Physician, New York Hospital, New York*. 642 pages, illustrated. Oxford University Press, New York, N. Y., publishers, 1948. Price \$12.

The symptom of headache is the most common complaint that is presented to the physician. It is frequently one of the most distressing of human discomforts but, in the past, little has been known of its nature and pathogenesis. In the past 15 years Dr. Wolff and his fellow workers have intensely studied the cerebral circulation and the other pain-sensitive structures within the cranial vault. This text is an excellent summary of Dr. Wolff's work and his observations on the work of other investigators. The close observation of clinical symptomatology is noted throughout the text. The major criticism of the text is that it supposedly covers headache and other head pain, however, there is less than one page allotted to the "psychogenic" headache, and after following patients with all of the suggested diagnostic and therapeutic aids as outlined, one is definitely hesitant to say that "psychogenic" headache is found only in a small percentage of patients.

In a little over 20 chapters, Dr. Wolff covers the problem of the organic approach to headache very well. This book is an excellent reference on headache.—*Lt. W. H. Boxwell (MC) U. S. N.*

**NEUROSURGICAL PATHOLOGY**, by I. Mark Scheinker, M. D., *Assistant Professor of Neuro-pathology and Assistant Professor of Medicine (Neurology) University of Cincinnati, College of Medicine; Neuropathologist and Attending Neurologist, Cincinnati General Hospital*. 370 pages, illustrated. Charles C. Thomas, Springfield, Ill., publishers, 1948. Price \$8.75.

This second book of Dr. Scheinker's series of three on neuropathology deals in considerable detail with injuries and tumors of the central nervous system. Other short chapters on cerebral swelling, cerebral abscesses and hydrocephalus are included.

The chapters on central nervous system injuries occupy more than a third of the volume. It deals in a repetitious manner with the effects of injury on the brain as a whole rather than locally. The evolutionary principle of structural lesions and the extensive interaction between vascular supply and structural



alterations are two concepts which are emphasized. Skull fracture and superficial brain lacerations are not considered.

In the chapter on tumors, which occupies approximately one-half the book, Dr Scheinker says that his aim is to present a simplified tumor classification based exclusively upon the use of preparations stained with hematoxylin and eosin. He states this simplified scheme makes it possible for every neurosurgeon to assume full responsibility for a correct post-mortem laboratory examination, without specialized laboratory assistance and without special training in neuropathology. Although he states that rare tumors are to be omitted the discussion of subependymoma occupies twice as much space as the discussion of ependymoma. Similarly diffuse cerebral glioblastosis is discussed in greater detail than any other heading under gliomas. In the discussion of individual tumors insufficient diagnostic criteria are given and some are given undue emphasis. For instance it is stated that the most outstanding characteristic of glioblastoma multiforme is the pseudopalisade formation due to necrosis; and the characteristic tendency of the astroblasts to arrange themselves about blood vessels in typical radiating fashion is often sufficient to warrant diagnosis of astroblastoma from a hematoxylin and eosin section. It is felt that Dr Scheinker has fallen short of his mark.

The chapters on cerebral swelling, cerebral abscess, and hydrocephalus are adequate. The book is profusely illustrated. Some of the illustrations are inferior in quality, some of insufficient magnification to illustrate the point being made and some are repetitious. The references and index suffice.

—Lt B K Black (MC) U S A

### BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

**POLLFN-SIDES STUDIES** by Grafton Tyler Brown, M D. *Instructor in Clinical Medicine, Georgetown University School of Medicine, Consultant on Allergy, United States Public Health Service, Head, Division on Allergy, Doctors Hospital, Washington, D C* with a foreword by Wallace M Yater, M D, M S (In Medicine), F A C P. *Director, Yater Clinic, Civilian Consultant Army Institute of Pathology and Walter Reed General Hospital formerly Professor of Medicine, Georgetown University School of Medicine, Washington, D C* 122 pages with 98 figures. Charles C Thomas Springfield Ill publishers 1949. Price \$6.

**INTRODUCTION TO PARASITOLOGY With Special Reference to the Parasites of Man**, by Ann C. Chandler M S Ph D, *Professor of Biology, Rice Institute Houston, Texas, former Officer-in-Charge, Hookworm Research Laboratory, School of Tropical Medicine and Hygiene, Calcutta, India* 8th edition. 756 pages illustrated. John Wiley & Sons, Inc., New York, N Y, publishers, 1949. Price \$6.

**THE WORLD AS I SEE IT**, by Albert Einstein. Translated by Alan Harris. 112 pages. Philosophical Library, New York, N Y, publishers, 1949. Price \$2.75.

**THE MAGIC CLOCK, A Contribution to the Psychology of Authoritarianism** by James Clark Moloney M D. 343 pages with illustrations by Eric Loran. The Montrose Press, Wakefield, Mass., publishers, 1949. Price \$3.

**NURSING IN CLINICAL MEDICINE**, by Julius Jensen, Ph D (In Medicine), M R C S. (Eng.), L R C P (Lond), *Assistant Professor in Medicine, Washington University, St Louis, Member of Staff, St Luke's Hospital, St Louis, Diplomate of American Board of Internal Medicine (Cardiovascular Disease)* and Deborah Maclure Jensen, M A, B Sc, R N, *Lecturer in Nursing Education, Washington University, St Louis; Visiting Instructor at St Louis City and St Luke's Hospital, St Louis, formerly Social Service Consultant, Visiting Nurse Association, St Louis* 3d edition. 791 pages. The Macmillan Co., New York, N Y, publishers, 1949. Price \$4.

- ESSENTIALS OF GYNECOLOGY**, by Leo Brady, M. D., F. A. C. S. *Assistant Professor of Gynecology, Johns Hopkins University, Assistant Professor of Gynecology, University of Maryland, Assistant Attending Gynecologist, Johns Hopkins Hospital; Consulting Gynecologist, Church Home and Infirmary, Hospital for the Women of Maryland, St. Joseph's, The Union Memorial and University Hospitals, Ethna Louise Kurtz, R. N., formerly, Head Nurse, Brady Urological Institute, Johns Hopkins Hospital; formerly Supervisor, Gynecological Operating Room, Johns Hopkins Hospital, and Eileen McLaughlin, B. S., R. N., Instructor and Supervisor, Gynecological Nursing, Johns Hopkins Hospital* 2d edition 236 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1949. Price \$3.
- MARIHUANA IN LATIN AMERICA**, The Threat It Constitutes, by Pablo Osvaldo Wolff, M. D., Ph. D., M. A., Buenos Aires, Argentina. *Member of Expert Committee on Habit Forming Drugs of the World Health Organization, sponsored by Washington Institute of Medicine.* 56 pages. The Linaere Press, Inc., Washington, D. C., publishers, 1949. Price \$1.50.
- PERIODONTIA**, A Study of the Histology, Physiology, and Pathology of the Periodontium and the Treatment of Its Diseases, by Henry M. Goldman, D. M. D., *Chief of Stomatology and Head of the Dental Department, Beth Israel Hospital; Periodontist, Massachusetts General Hospital, Boston, Mass.; Consultant, Army Institute of Pathology, Washington, D. C.* 2d edition 611 pages, with 488 illustrations including 18 in color. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$12.50.
- ATLAS OF OBSTETRIC TECHNIC**, by Paul Titus, M. D. *Obstetrician-Gynecologist to the St. Margaret Memorial Hospital, Pittsburgh; Secretary, American Board of Obstetrics and Gynecology* Illustrations by E. M. Shackelford, *formerly Medical Illustrator, John C. Oliver Memorial Research Foundation, St. Margaret Memorial Hospital, Pittsburgh* 2d edition 197 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$7.50.
- A DESCRIPTIVE ATLAS OF RADIOGRAPHS**, An Aid to Modern Clinical Methods, by A. P. Bertwistle, M. C., Ch. B., F. R. C. S. Ed. 7th edition, revised and enlarged 622 pages, with 980 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$15.
- ISOTOPIC TRACERS AND NUCLEAR RADIATIONS**, With Applications to Biology and Medicine, by William E. Sirl, with contributions by Ellsworth C. Dougherty, Cornelius A. Tobias, James S. Robertson, Rayburn W. Dunn, and Patricia P. Weymouth, *Division of Medical Physics, Department of Physics, and Radiation Laboratory, University of California.* 653 pages; 136 illustrations. The McGraw-Hill Book Co., New York, N. Y., publishers, 1949. Price \$12.50.
- A PRACTICE OF ORTHOPAEDIC SURGERY**, by T. P. McMurray, C. B. D., M. B., M. Ch., F. R. C. S. (Edin.) *Professor of Orthopaedic Surgery, Liverpool University, Honorary Orthopaedic Surgeon, David Lewis Northern Hospital, Director of Orthopaedics, Royal Liverpool Children's Hospital, Consulting Orthopaedic Surgeon, Lancashire County Council, Visiting Orthopaedic Surgeon, Alder Hey Children's Hospital, Liverpool, Consulting Surgeon to the Ministry of Pensions Hospital, Regional Orthopaedic Consultant, Ministry of Health, etc.* 3d edition 444 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$8.
- ILLUSTRATIONS OF SURGICAL TREATMENT**, Instruments and Appliances, by Eric L. Farquharson, M. D., F. R. C. S. (Ed.), F. R. C. S. (Eng.), *Assistant Surgeon, Royal Infirmary, Edinburgh; member of Clinical Teaching Staff, University of Edinburgh; Surgeon, Berwick-on-Tweed Infirmary; Assistant Surgeon, Kirkcaldy Hospital.* With a foreword by the late Sir John Fraser, Bt., K. C. V. O., M. C., M. D., Ch. M., F. R. C. S. (Ed.), *formerly Regius Professor of Clinical Surgery, University of Edinburgh* 3d edition. 391 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$7.
- INJURIES OF THE BRAIN AND SPINAL CORD AND THEIR COVERINGS**, Neuro-Psychiatric, Surgical, and Medico-Legal Aspects. Edited by Samuel Brock, *New York University, with 28 contributors.* 3d edition 783 pages; illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$10.
- A COMPANION IN SURGICAL STUDIES**, by Ian Aird, Ch. M., F. R. C. S., *Professor of Surgery in the University of London, Director of the Surgical Unit, Postgraduate Medical School of London.* 1060 pages. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$15.

**PHOTORADIOGRAPHY IN SEARCH OF TUBERCULOSIS** by David Sachs M. D. *Chief of Clinics, Massachusetts Department of Public Health* 297 pages, illustrated The Williams & Wilkins Co. Baltimore, Md., publishers, 1949 Price \$3

**STREPTOMYCIN NATURE AND PRACTICAL APPLICATIONS**, edited by Selman A. Waksman Ph. D., *New Jersey Agricultural Experiment Station Rutgers University* with 59 contributors 618 pages illustrated The Williams & Wilkins Co., Baltimore, Md., publishers 1949 Price \$10

**STEDMAN'S MEDICAL DICTIONARY**, edited by Norman Burke Taylor, M. D., F. R. S. C., F. R. C. S. (Edin.) F. R. C. P. (Can.) M. R. C. S. (Lon.) *University of Western Ontario and formerly of the University of Toronto*, in collaboration with Allen Ellsworth Taylor, D. S. O., M. A. 17th revised edition with etymologic and orthographic rules 1361 pages illustrated The Williams & Wilkins Co. Baltimore Md., publishers, 1949 Price \$4.50 with thumb index, \$3 without thumb index

**TREATMENT IN PROCTOLOGY** by Robert Tuttle, B. S. M. D. *Attending Proctologist Hillside Hospital, Adjunct Surgeon in Proctology Montefiore Hospital Adjunct Surgeon in Proctology, Beth Israel Hospital Senior Clinical Assistant Rectal Clinic, Mount Sinai Hospital New York* with a chapter on psychosomatic problems by Louis Linn, M. D. 248 pages, illustrated The Williams & Wilkins Co. Baltimore Md. publishers, 1949 Price \$7

**THE ORIGIN OF MEDICAL TERMS** by Henry Alan Skinner M. B. F. R. C. S. (C) *Professor of Anatomy University of Western Ontario* 379 pages The Williams & Wilkins Co., Baltimore, Md. publishers 1949 Price \$7

**BLOOD AND PLASMA TRANSFUSIONS** by Max M. Strumia M. D. Sc. D. (Med.) *Associate Professor of Pathology Graduate School of Medicine, University of Pennsylvania; Director, Laboratory of Clinical Pathology and of the John S. Sharpe Research Foundation Bryn Mawr Hospital Member, Subcommittee on Blood Substitutes of the National Research Council 1940-1941, and John J. McGraw, Jr. M. D., Instructor in Pathology, Graduate School of Medicine, University of Pennsylvania Assistant Attending Pathologist Bryn Mawr Hospital formerly, Commanding Officer of the Blood Bank for the Mediterranean Theater of Operations, Chief of the Blood Research Division of the Army Medical School, and Special Representative to the Surgeon General on Blood and Plasma Transfusion* 497 pages 124 illustrations F. A. Davis Co., Philadelphia, Pa., publishers, 1949 Price \$7.50

**FUNDAMENTALS OF PHARMACY**, Theoretical and Practical, by Walter H. Blome, Ph. C. M. S., M. A., *Emeritus Professor of Pharmacy, Wayne University, College of Pharmacy, Detroit, Mich.*, and Charles H. Stocking, Ph. C. M. S. *Dean, University of Michigan College of Pharmacy Ann Arbor Mich.* With contributions by Elmon L. Cataline Ph. D. Robert L. Jones Ph. C. M. S. and Edward C. Watts B. S. 2d edition revised 312 pages with 158 illustrations Lea & Febiger, Philadelphia, Pa., publishers, 1949 Price \$5

**SURGICAL MANAGEMENT OF VASCULAR DISEASES**, by Gerald H. Pratt, M. D., F. A. C. S. *Associate Clinical Professor of Surgery New York University, Chief of the Vascular Clinic and Associate Attending Surgeon, Saint Vincent's Hospital, City of New York, Attending Surgeon St. Clare's Hospital City of New York, Diplomate of American Board of Surgery Commander Medical Corps, United States Naval Reserve* 496 pages, illustrated Lea & Febiger Philadelphia Pa. publishers, 1949 Price \$10

A Text



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**COVER PHOTOGRAPH**

*The main entrance to Tripler General  
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THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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*United States Air Force*

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# THE SECRETARY OF DEFENSE

WASHINGTON

27 JANUARY 1949.

## MEMORANDUM FOR THE SECRETARY OF THE ARMY THE SECRETARY OF THE NAVY THE SECRETARY OF THE AIR FORCE

**SUBJECT:** Nomenclature and Definitions Pertaining to Fixed Medical Treatment Facilities

1. In order to effect more uniformity in the nomenclature and definitions used in the Department of Defense with respect to fixed medical treatment facilities, it is the policy of the Department of Defense to use the following nomenclature and definitions with reference to the "capacities" and the "bed status" of such facilities

### A. With respect to "capacities" of fixed medical treatment facilities

(1) *Mobilization Bed Capacity* is space for patients' beds and is measured in terms of the number of beds which can be set up in wards or rooms designed for patients' beds, spacing beds 6 feet between centers (approximately 72 square feet per bed). Former ward space which has been disposed of or has been structurally altered to serve another purpose is not included in computing bed capacities. Space for beds used only in connection with examination or brief treatment periods, such as that in examining rooms or in the physiotherapy department, is not included in this figure. Nursery space is not included in the bed capacity but is accounted for separately in terms of the number of bassinets it accommodates.

(2) *Normal Bed Capacity* or capacity for normal peacetime use is space for patients' beds and is measured in terms of the number of beds which can be set up in wards or rooms designed for patients' beds, spacing beds 8 feet between centers (approximately 100 square feet per bed). Former ward space which has been structurally altered to serve another purpose is not included in computing bed capacities. Space for beds used only in connection with examination or brief treatment periods, such as that in examining rooms or in the physiotherapy department, is not included in this figure. Nursery space is not included in the bed capacity but is accounted for separately in terms of the number of bassinets it accommodates.

B With respect to the use being made of the above "bed capacities" of fixed medical treatment facilities (i. e., as to the availability of beds set up and as to the status of the remaining spaces for beds):

(1) *Operating beds* are those medical treatment facility beds which are currently set up and in all respects ready for the care of patients and which the facility is staffed and equipped to operate. Bassinets for the use of newborn infants in the nursery are not included in the count of operating beds, but are accounted for separately.

(a) *Occupied Beds* is the number of operating beds in a medical treatment facility which are currently assigned to patients. It does not include any beds for patients who are on leave or absent without leave.

(b) *Operating Beds Available* is the number of operating beds in a medical treatment facility which are not currently assigned to patients.

(2) *Inactive Beds* are those medical treatment facility bed spaces with beds, not necessarily set up, for which equipment and fixtures are on hand and installed, but for which operating staff is not provided. Inactive beds may be converted to operating beds within a day or two after the necessary staff is made available.

(3) *Latent Reserve Beds* are those medical treatment facility bed spaces for which are lacking not only the required staff but also some or all of the equipment and fixtures necessary to convert them to operating beds. Maintenance repairs may be required to effect this conversion. The time required to convert latent reserve beds to operating beds will vary and may be prolonged.

It is intended that a fixed medical treatment facility operating with beds set up on 8-foot centers (approximately 100 square feet per bed) will also count inactive beds and latent reserve beds on this basis. Thus, when no space is being counted by mobilization capacity criteria, the sum of the *operating beds*, *inactive beds* and *latent reserve beds* is equal to the *normal bed capacity*. A fixed medical treatment facility currently authorized to set up operating beds on 6-foot centers (approximately 72 square feet per bed) will count inactive beds and latent reserve beds on the basis of 6-foot centers (by mobilization capacity criteria) and also on the basis of 8-foot centers (by normal capacity criteria).

2. The above seven (7) terms for standard use throughout the Department of Defense will supplant the larger number of nonstandard terms of this nature heretofore variously used. The use of terms having indefinite or not uniformly understood meanings, such as maximum capacity, constructed capacity, emergency capacity, authorized capacity, beds assembled and beds vacant, will thus be obviated.

3. It is requested that you take the necessary action in your departments to implement the above Department of Defense policy at the earliest possible date, so that reports for periods beginning on or after 1 April 1950 will be in conformity with the above nomenclature and definitions.

(S) LIVEN C. ALLEN,  
Major General, U. S. A.,  
Executive Secretary.

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## Congestive Heart Failure

### Backward and Forward Failure Hypotheses

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ALTHOUGH thousands of patients have been treated for congestive heart failure, there is no universally accepted theory regarding the altered physiologic state in this condition. It would be well to define the conceptions of heart failure, circulatory failure, and congestive heart failure before beginning a general discussion of the subject. Dock (1) states:

Heart failure should be applied only to the clinical disorder which is due to the inability of the myocardium of the ventricles to maintain the requisite flow of blood to all the tissues of the body. Circulatory failure should be used for those conditions in which requisite flow is not maintained in spite of an adequate myocardium because shock, hemorrhage, pericardial tamponade, constrictive pericarditis, or extreme rates of tachycardia prevent adequate diastolic filling of the ventricles.

This indicates that in circulatory failure there is no primary weakness of the myocardium.

The term, "congestive heart failure," is applied to that syndrome in which myocardial weakness is associated with such signs and symptoms as edema, increased blood volume, increased venous pressure, and the concomitant symptoms of dyspnea and weakness. In short, con-

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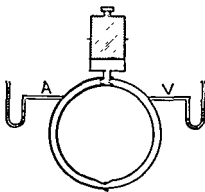
gestive heart failure is waterlogging of the tissues in close association with myocardial weakness.

### MECHANISM

How does this occur? In 1832, James Hope propounded the "dam and stream" analogy (2) (3). This is the basis for the so-called "backward failure" theory of congestive failure (4). The "dam and stream" analogy pictures the blood in the great veins as being a pond before a dam in a flowing stream. The heart is the pump which lifts the water over the dam. As the pump weakens more water runs into the pond than is pumped out, and the water level (venous pressure) rises (2). In other words, blood backs up behind the failing heart.

In 1889, Julius Cohnheim made the first studies on experimentally produced heart failure by injecting oil into the pericardial cavities of animals, producing pericardial tamponade. This not only gave rise to an increase in venous pressure, but also a fall in arterial pressure. Hence, he concluded that inadequate cardiac output, so-called "forward failure," played a part in the clinical syndrome as well as the "backward failure" (5). It should be noted that Cohnheim actually produced circulatory failure, according to the definition as stated before, and not congestive heart failure as we ordinarily think of it.

In the late nineteenth century the development of apparatus for the experimental study of circulatory phenomena came into vogue (2). One of the simplest forms of circulation schema is shown in figure 1 (after Starr) (2). The apparatus works as follows. Before the pump is started a pressure of 10 mm exists throughout the system. This is the static pressure. When one pumps hard the pressures become  $A=120$ ,  $V=4$ . When one pumps weakly, the pressures become  $A=70$ ,  $V=8$ . Increasing the resistance at the pinchcock increases arterial pressure but always diminishes venous pressure simultaneously; decreasing resistance has the opposite effect. Increased



*Courtesy of Annals of Internal Medicine*  
Figure 1—The simplest form of circulation schema.

venous pressure together with a maintained arterial pressure cannot be brought about by either weakening the pump, changing the resistance, or any combination of the two. Let us now inject more water into the system. This lodges chiefly in the most distensible parts, that is, the "veins." The static pressure is now 20 mm. After beginning to pump,  $A=120$ ,  $V=15$ . Increased venous pressure in the presence of a normal arterial pressure is now attained.

About 35 years ago Starling and his associates published their work with the heart-lung preparation, from which the "law of the heart" was formulated. In brief, Starling's law states that the energy output of the heart is directly related to its diastolic volume (6).

All of the foregoing work has formed the basis for the "backward failure" theory, which has been so widely accepted that Starr (2) speaks of it as the "classical" view. It may be well at this time to state in simple terms this classic view of "backward failure." Overwork of the heart leads to enlargement, particularly of those portions of the heart which are subjected to the increase in work. If dilatation of a chamber becomes extreme, there is a rise in the venous pressure behind the chamber. This increased venous pressure leads to congestion of the organs drained by these veins. For example, in a patient with mitral stenosis, dilatation of the left auricle eventually occurs. Subsequently, increased pulmonary venous pressure and pulmonary congestion occur, followed by an increase in the pulmonary arterial pressure with consequent strain upon the right ventricle. Continuing with this line of reasoning, the right ventricle dilates, the tricuspid valve becomes incompetent, and the venous pressure in the right auricle and systemic veins is elevated. It is the increased venous pressure in the peripheral circulation that theoretically brings about the congestion and peripheral edema so characteristic of congestive heart failure.

This classical view has been accepted by most French and German clinicians since Hope's day (4). It has been clearly expressed and the conception of left and right heart failure has been carefully delineated by Harrison (5). He concludes that the clinical manifestations of congestive heart failure are due to back pressure, dyspnea being brought about by pulmonary congestion which is the result of back pressure from the left side of the heart. The peripheral edema follows congestion of the systemic circulation which is dependent on the back pressure from the right side of the heart. In both instances, the rise in venous pressure is dependent on dilatation of the chambers of the corresponding side of the heart, the dilatation being a manifestation of fatigue of the cardiac muscle. *The dilated heart is an inefficient pump for, although it may supply an adequate amount of blood, it expends excess energy in carrying on this work. Heart failure should be attributed in the main to inefficiency, rather than to insufficiency, of the myocardium (5).*

In the English-speaking countries, until recently, the most favored theory has been the "forward failure" of Ellis (4) ("recently" coinciding with Harrison's (5) views). In simple terms, the "forward failure" theory holds that the manifestations of cardiac decompensation are caused in the main by an inadequate output of blood by



the heart (4). In other words, the function of the heart is to pump blood to meet the metabolic requirements of the body; thus the symptoms of the failing heart are primarily caused by an inadequate cardiac output and not to an increase in venous pressure behind the failing cardiac chamber. The "forward failure" theory was advocated by Sir James MacKenzie, Sir Thomas Lewis (4), and many others. It was with the advent of the work of the Stead group (7) in 1944 that this theory again gained popularity. Stead observed that many patients showed an increase in extracellular fluid, i. e., an increase in weight, before they showed an increase in venous pressure. In other words, there is a retention of salt and water prior to the development of the increased venous pressure, which is supposedly the first phenomenon associated with cardiac failure according to the backward pressure theory.

Before entering into a more detailed discussion of the chain of events which purportedly occurs according to these two main hypotheses, we should briefly review the physiology of edema formation, blood volume regulation, changes in venous pressure, and the regulation of cardiac output by examining their relationship to congestive heart failure.

#### CHARACTERISTICS

Edema is a prominent sign associated with progressive heart failure. Fluid transfer between the capillaries and the extracellular spaces depends, in the main, upon the hydrostatic blood pressure, the plasma osmotic pressure, the tissue osmotic pressure and the tissue tension (8). Normally, the hydrostatic pressure and the plasma osmotic pressure are the most important factors (8). Edema may be caused by: (a) increased capillary permeability, as in burns; (b) increased hydrostatic pressure (hydrostatic pressure may be augmented by increased venous pressure or arteriolar dilatation); (c) lymphatic obstruction; (d) hypoproteinemia; and (e) a disturbance of electrolyte and water balance as in Addison's disease. Lymphatic obstruction and increased capillary permeability play little part in the edema of congestive heart failure. The protein content of the edema fluid in congestive heart failure is usually less than 0.5 gm. per 100 cc. (7). The protein content of lymphatic edema or transudation due to increased capillary permeability is much higher than this. It should be noted that if anoxemia causes excessive capillary permeability, this mechanism would not appear to be significant in congestive heart failure (7).

The other three causes of edema are probably operative in congestive heart failure. The capillary hydrostatic pressure may be raised by increased venous pressure and blood volume. Hypoproteinemia may also be a factor in cardiac edema as the total blood protein concentra-

tion is usually decreased in congestive heart failure for perhaps a variety of reasons, such as hemodilution, decreased protein intake, and increased protein loss (7). There is, however, not enough decrease in the total protein concentration on the whole to make this the primary cause of cardiac edema. That there is a decrease in the elimination of salt and fluid by the kidney in congestive heart failure is well known. This retention of salt is thought by Stead and his associates to be the primary factor in cardiac edema. Clinically, the earliest sign of edema formation is a gain in weight, several pounds of fluid may collect in the extracellular areas before a pitting edema is demonstrable.

It is agreed that there is an increased blood volume in congestive heart failure (5). This is principally an increase in plasma volume. In the normal resting subject with constant arterial pressure and circulating red blood cells, the plasma volume may be altered by: (a) changing the amount of circulating protein; (b) changing the capillary hydrostatic pressure; and (c) changing the extracellular fluid volume. The first two causes are easily understood. The mechanism of the third cause should be explained. If one decreases the extracellular volume by dehydration, there is also a decrease in plasma volume. Conversely, if the extracellular volume is increased by the use of desoxycorticosterone acetate, the plasma volume increases. Perhaps the best example is seen in nephrosis. Despite the extremely low plasma proteins in nephrosis, the circulating blood volume is maintained by the tremendous increase in extracellular volume, or edema (7). In congestive heart failure the extracellular volume and the plasma volume increase and decrease concordantly (7).

An increased venous pressure is characteristic of congestive heart failure. It may be brought about by: (a) obstruction to the veins; (b) vasoconstriction, as by adrenalin, paradrenal sulfate, or angiotonin (7); (c) gravity (this point is self-evident, but it should be remembered that venous pressure changes due to gravity are much greater than those caused by congestive heart failure); and (d) increase in blood volume.

Obstruction to a vein and the effects of gravity are of great importance in the localization of edema but would not of themselves be a common cause of generalized edema. Gravity causes a dependent type of edema in the cardiac patient and a periorbital edema in the nephritic patient. If an edematous nephritic patient is placed in a cardiac position, his edema becomes dependent. As Starr (2) states, cardiac patients with edema but without orthopnea may have periorbital edema.

The expanded blood volume plays a part in the increased venous pressure in congestive heart failure, but the role of vasoconstriction

is unknown (2). The volume of blood in the great veins can be increased without increasing the total circulating blood volume. This may be brought about by a redistribution of the blood from the arteries and the small vessels as by arteriolar dilatation (decreased peripheral resistance) or by increasing the tissue tension (2). The venous pressure may also be elevated as a part of a widespread general vasoconstriction as may be produced in animal experiments by asphyxia (9). These latter factors may play a part in the increased venous pressure of congestive heart failure.

It should be noted that all of the preceding factors influencing the venous pressure may be noncardiac in origin.

The relationship of the cardiac output to congestive heart failure can be noted by studying one of the simplest forms of circulation schema (fig 1).

In general, patients in congestive heart failure have a diminished cardiac output (7) (10). However, exceptions to this (such as Graves disease, beriberi, arteriovenous fistula, Paget's disease) are well known (1). In the circulation schema, if one pumps vigorously the cardiac output and arterial pressure will rise but the venous pressure will fall. If one pumps weakly the converse becomes true. By changing the peripheral resistance the arterial and venous pressures may be changed, but never concordantly (2). The only manner in which the arterial pressure and venous pressure can both be raised simultaneously is by the injection of more fluid into the system. This additional fluid naturally goes to the most distensible portions of the system—that is, the veins—and the over-all static pressure is increased. Static pressure is that which exists throughout any circulatory system when the pump is not working. After the static pressure has been increased by the injection of additional fluid, the arterial pressure rises, but the venous pressure falls when the pump is started (2). However, the venous pressure is still higher than it was before the addition of the extra fluid.

Stead, Warren, and Brannon (11) studied the cardiac output in patients at rest with congestive heart failure. They found the following combinations to exist:

(a) Cardiac output low with failure, remains low with the disappearance of symptoms. Symptoms relieved by sodium restriction and continued use of diuretics.

(b) Cardiac output low with failure, increases with compensation.

(c) Cardiac output normal with failure, remains normal with compensation. Decompensation develops with increased activity.

(d) Cardiac output high with failure, falls with compensation. This combination may be shown by restless, apprehensive dyspneic patients whose output is adequate for rest but inadequate with mild

exertion, or by patients with hyperthyroidism, anemia, arteriovenous fistula, patent ductus arteriosus, beriberi, and certain infections (11).

From the foregoing it is seen that the degree of cardiac output has no direct relationship to the degree of congestive heart failure, and that the venous pressure is no reliable index of cardiac strength or weakness (2).

#### THE "BACKWARD FAILURE" HYPOTHESIS

The "backward failure" theory states that increased venous pressure is the first sign of myocardial failure and that increase in blood volume, edema, and renal retention of salt and water all follow the increase in venous pressure. It seems reasonable to believe that as the heart fails and dilates, and residual ventricular blood accumulates, there will be a slight increase in central venous pressure (12). However, it is quite doubtful that this elevation of central venous pressure is of sufficient magnitude to account for the other characteristics of congestive failure. Altschule (13) (14) quotes Smirk as stating that the venous pressure commonly found in cardiac decompensation is not in itself sufficient to produce pitting edema. Further, if the initial increase in venous pressure is the cause of cardiac edema, then we would expect the blood volume to decrease as the shift of fluids to the tissues takes place; actually the blood volume is increased. It has been suggested that a high venous pressure causes kidney dysfunction resulting in edema, but raising the venous pressure to the degree seen in early congestive failure, does not decrease the renal blood flow or inhibit excretion of salt and water (12). In any case, if this sequence of events is correct, then it should be possible to experimentally produce a rise in venous pressure by damage to the heart. The only way the pressure pattern found in clinical congestive failure can be reproduced in the circulation schema is by increasing the fluid volume.

Starr (2) sums up this type of work in experimental animals as follows:

Increased venous pressure at rest may be caused by constriction of the blood vessels and by increased blood volume, even though the heart is organically sound; and it follows cardiac tamponade, as it must if the heart is to be filled at all. But direct damage to the heart muscle of an intact animal does not cause it as long as the animal is at rest, and therefore increased venous pressure at rest is not the direct consequence of cardiac weakness.

Clinically, the most common example of severe myocardial damage infrequently attended by increased venous pressure or congestive heart failure is myocardial infarction. Yet we hesitate to give intravenous fluids in coronary occlusion for fear of precipitating heart failure. This is a clinical example of the necessity of having an extracardiac

factor present, i. e., increased blood volume associated with a weak heart before congestive failure can occur. If increased venous pressure is the initial sign of a damaged myocardium, it should appear more frequently in myocardial infarction than it apparently does. Dock (1) points out that in young vigorous men the normal blood volume is relatively large, and it is in this group that we may see sudden failure following myocardial infarction; whereas in older patients with relatively small blood volumes this does not occur so frequently.

If increased venous pressure is the primary cause of pulmonary edema, then clinically we would expect to see such edema most frequently in that group of patients having the highest venous pressure in the pulmonary circuit. However, as Dock points out in mitral stenosis one frequently observes that the lungs may be free of râles even after right heart failure has set in and the liver is enlarged. We know that these cases of mitral stenosis have been walking about for years with extremely high pulmonary pressures. In animal experiments, Visscher (12) was unable to produce pulmonary edema by obstructing the pulmonary veins. Perhaps increased vascular thickening or increased lymph flow plays a part in decreasing the formation of pulmonary edema in mitral heart disease.

Warren et al. (7) performed a very simple clinical experiment in order to determine whether the venous pressure was the initial feature in the chain of events following a failing heart. They first treated congestive heart failure patients with bed rest, low sodium diet, and mercurial diuretics. After the patients were controlled, bed rest was continued but mercurial diuretics were withheld. Then a high sodium diet was administered, and frequent observations of weight, blood volume, and venous pressures were recorded. They found a definite increase in weight and blood volume prior to a rise in venous pressure. Starr (2) has noted this series of events, also.

Therefore, if a rise in venous pressure is not the primary manifestation of the failing heart, we must look elsewhere than the "backward failure" theory for an explanation of the mechanism for congestive heart failure.

#### THE "FORWARD FAILURE" THEORY

At the present time the chain of events as expressed by Starr and similarly by Stead et al. to explain the mechanism of "forward failure" is essentially as follows. Impaired cardiac function, retention of salt and water; increased blood volume; and then venous congestion. In association with this chain of events there is hemodilution, and both a decreased hematocrit, and decreased percentage of circulating proteins. Merrill (15) has shown that the renal blood flow in the presence of congestive heart failure is greatly reduced and that the filtra-

tion rate is also reduced. He has reported that the retention of salt by the kidney resulting in the edema of congestive heart failure is caused by a low filtration rate and not by an increased reabsorption of salt. The renal blood flow was found to be reduced to about one-fifth of normal when the cardiac output was reduced only to about one-half of normal, indicating a specific diversion of blood from the kidney. Merrill believed that when the cardiac output became inadequate to meet the metabolic demands of the body ("forward failure") the blood may be diverted from the kidneys to other parts of the body having greater metabolic needs. He further found that there was no correlation between renal blood flow and venous blood pressure. The mechanism of congestive failure may be explained as follows:

(a) *Heart disease.*—Myocardial dysfunction is the most common denominator of congestive heart failure.

(b) *Renal retention of salt and water.*—If heart disease is progressive, a time will come when the cardiac output is insufficient to meet the demands of the body. This inadequacy, everything else being equal, would be most likely to occur first under excessive metabolic demands, i. e., the signs of the slowly failing heart should first become apparent on exercise anemia, severe infection, or other complications. The cardiac output would thus be adequate for the body at rest but inadequate under excessive metabolic demands. Clinically, such a situation certainly appears to exist, for many patients, if not most, will compensate on bed rest alone unless the heart disease is rapidly progressive.

If the cardiac output is insufficient to meet the metabolic demands of the body, what homeostatic compensatory mechanisms are available to aid in the adjustment of the inadequate heart? The blood circulation may be augmented by speeding the rate, as in anemia or beriberi, or by increasing the total blood volume. In situations in which the circulatory rate is primarily increased the failure that develops is of high output type; with compensation the cardiac output falls. The clinical examples of increased metabolism in which the total blood volume is increased apparently as a compensatory mechanism, occurs in hyperthyroidism, and in pregnancy where the metabolic demand must be high. Perhaps it is this compensatory mechanism which develops in cases of congenital heart disease. A compensatory blood volume increase also occurs in the polycythemia of high altitudes. If the cardiac output is inadequate the body may compensate by increasing the circulating medium.

Dock (1) states:

When decrease in cardiac output is due to shock or hemorrhage, the immediate effect of changes in the tone of venules and arterioles is to bring venous pressure back toward normal, and to shift the balance of fluid change between blood and

tissues towards the intravascular side. Thus blood volume tends to increase by hemodilution unless the patient is dehydrated.

This temporary mechanism in shock is not sufficient to explain the blood volume changes in congestive heart failure. Obviously, if salt and water were retained by the kidneys, the blood volume would be increased, and certainly in congestive heart failure urinary excretion is decreased. As a part of the compensatory mechanism to maintain or expand the blood volume the kidney may reabsorb sodium. It is axiomatic that if either sodium or chloride or water is retained primarily, the others will be retained to maintain electrolyte balance (7). Peters (16) states that the kidney manages salt and water excretion or retention in the following manner. As approximately 180 liters of isotonic glomerular filtrate pass through the proximal tubules per day, 60 to 80 percent of the water, all the glucose and fractions of other solutes are removed, together with a quantity of sodium and chloride. A hypotonic solution is left, but the sodium to chloride ratio, previously about 1:3, is now 1:1—as the sodium bicarbonate has been reabsorbed leaving the remaining sodium as sodium chloride. In the loop of Henle a variable amount of sodium chloride is withdrawn with some water, however, more salt than water is reabsorbed here, leaving a hypotonic solution. Finally, in the terminal convoluted tubule water is absorbed to yield the fully elaborated urine which is usually hypertonic. The renal reabsorption of water in the terminal tubule appears to be chiefly controlled by the antidiuretic hormone of the posterior pituitary. However, in the presence of an excess amount of salt this hormone will not cause an increased reabsorption of water. In other words, the salt demands water for excretion and has a functional or osmotic priority for water over the hormone. Therefore, when the body needs to retain fluid it must retain salt, for the terminal tubules, although stimulated by the posterior pituitary, cannot reabsorb water in the presence of excess salt. Thus, as a compensatory mechanism to expand the blood volume we would expect the kidneys to reabsorb sodium first and water secondarily. It is believed that part of the mechanism of sodium reabsorption is governed by the adrenal cortex, although other factors are probably operative, such as the enzyme system in the distal renal tubular cells. That sodium is the important factor is demonstrated by the action of mercurial diuretics. Reaser and Burch (17), using radioactive  $\text{Na}^{22}$ , demonstrated that in a mercurial diuresis the excretion of sodium preceded the water diuresis by 2 to 4 hours. Regardless of whether the retention of salt and water is caused primarily by decreased renal blood flow or to hormonal or enzyme factors, the important point is that a renal mechanism exists through which compensatory changes in blood volume may be made.

(c) *Increased blood volume* follows renal retention of salt and water.

(d) *Edema formation*.—As a result of increased blood volume there is an increase in hydrostatic pressure. (Starr (2) demonstrated an increase in hydrostatic pressure by measuring the venous pressure after death in patients who had succumbed to congestive heart failure.) With the increase in hydrostatic pressure transudation of fluid would occur.

(e) *Increased venous pressure*.—With the increased blood volume and increased tissue tension due to edema, two of the main causes of increased venous pressure would be present. Venous congestion would thus result. As the blood volume and extracellular fluid vary concordantly in congestive failure, the more edema present the greater the increase in blood volume and the greater the increase in venous pressure.

(f) *Increased work of the heart*.—According to Starling's law, the greater the venous pressure and diastolic filling of the heart, the greater the cardiac output. Hence, all of the foregoing events, from the renal retention of salt and water to the increase in venous pressure, are compensatory mechanisms which augment the cardiac output necessary for the adequate blood supply of the body. However, as Starling demonstrated, the metabolism of the myocardium is directly proportional to the diastolic volume (6). This increased metabolic need of the heart would lead, in the presence of progressive myocardial disease, to additional heart damage.

(g) *Additional heart damage*.—With progressive myocardial disease the foregoing series of events would be compounded and eventual, irreversible congestive heart failure would occur.

As an example, let us apply the preceding chain of events to cases of hypertensive heart disease with beginning failure of the left ventricle. The first signs of failure should occur with an increase in the basal metabolic rate. Many hypertensive patients can be up and about all day with little difficulty until they assume the decubitus position at night. However, because of inadequate output during the day, renal blood flow and sodium excretion are decreased, and the compensatory increase in blood volume occurs. Dock (1) states that these changes occur in normal subjects when kept in the upright position, which in itself reduces cardiac output by trapping blood in the distended veins below the diaphragm. Thus in these patients there is an increased blood volume which they do not need when they retire at night, for the cardiac output is then adequate to meet the basal metabolism during sleep. There is a consequent shift of intravascular fluid to extravascular areas, localization to the pulmonary circulation being favored by the tremendous pulmonary capillary bed and gravity.



There is a normal shift of venous blood to the thorax on assuming the recumbent position. This accounts for the reduction in vital capacity of approximately 8 percent found in normal persons when they lie down (5). In orthopneic congestive heart-failure patients the vital capacity is reduced an average of 25 percent by this position.

In addition, there are factors that probably favor increased right ventricular and lessened left ventricular output. During inspiration the output of the right heart is relatively greater than the output of the left heart (6). Further, it is recognized that inspiration is an active process and expiration a passive process, the latter being therefore greatly influenced by gravity and position. It is possible that in the recumbent position the right ventricular output tends to be relatively greater than the left.

Cournand states

The volume of blood contained in the pulmonary vessels is governed by the relative discharge of the two sides of the heart which are under the control of the dynamic changes in the systemic circulation

Also,

The capacity and the flexibility of the small vessels in the lungs are such that a several-fold increase in blood flow may be accommodated with negligible pressure changes

When the hypertensive patient with left ventricular failure lies down, because of his increased blood volume the previously mentioned factors cause an abnormally large shift of fluid to the pulmonary circuit. As a large amount of fluid can be retained in the lesser circulation before a rise in pressure occurs, one may postulate that sudden pulmonary edema would ensue in the presence of a reduced vital capacity before an increased pulmonary venous pressure would bring about a compensatory left ventricular output. That this mechanism of paroxysmal nocturnal dyspnea is correct is supported by the fact that usually the patient gains immediate relief from the symptoms by merely sitting up and breathing deeply. In so doing he increases his vital capacity and cardiac output. Patients with mitral stenosis seldom undergo this sudden nocturnal pulmonary edema because their pulmonary pressure is already elevated, and pronounced differences of cardiac output are not produced in such an abrupt fashion (6).

From the foregoing discussion of congestive heart failure it is apparent that the compensatory increase in blood volume is a long-term adaptation phenomenon which, although useful to a point, becomes deleterious in the end (12). Dock (1) gives the background of this compensatory mechanism as follows:

The rise in arterial pressure in heart failure and all the classical features of congestive failure are due to the fact that mammals have developed a complex and effective mechanism for dealing with a decrease in cardiac output occurring

in shock, hemorrhage, and dehydration, and that this mechanism comes into play whenever the cardiac output is reduced for any reason whatever. Without such a mechanism, heart failure would result only in fatigability, or if severe, in anuria and abdominal distention, weakness and syncope. The mammal evolved no reflex mechanism for dealing with myocardial failure as such, for the obvious reason that wild animals do not have heart failure during the normal reproductive life span. In civilized man the development of congestive failure is hastened by the high salt content of the diet, which makes possible rapid increases in blood and intercellular fluid volume, and by alternation between an erect posture, which diminishes cardiac output, and recumbency, which allows blood and edema fluid in the legs to be mobilized and pile up in the lungs.

### SUMMARY

The chain of events in the "forward failure" theory of heart disease may be outlined as follows: inadequate cardiac output, renal retention of salt and water, compensatory increase in blood volume, edema, elevation of venous pressure, increased ventricular diastolic volume, and temporarily increased cardiac output. In the presence of progressive myocardial disease, eventual, irreversible failure.

It is believed that the basic mechanism of chronic congestive heart failure is most compatible with the hypothesis of "forward failure." The "backward failure" features, although certainly operative to some degree, are not primary. A proper conception of the pathogenesis of this syndrome is necessary, for although little can be done for the cardiac factors involved, much may be done for the noncardiac factors, such as retention of salt and water and compensatory increase in blood volume. As Starr (2) points out, "factors directed to the elimination of fluid are becoming more and more successful in handling these cases and we are only at the beginning of our knowledge of this subject."

Clinically we are now seeing an increasing number of patients in whom, because of the restriction of salt and the use of mercurial diuretics, the classical signs of congestion and edema in the presence of an inadequate cardiac output are held in abeyance. In this group of patients the paramount limiting factors on activity are weakness and fatigue (14).

### REFERENCES

1. Dock, W.: Heart failure: relation of symptoms and signs to its severity and duration. *Ann. Int. Med.* 29: 11, 1948.
2. Starr, I.: Our changing viewpoint about congestive heart failure. *Ann. Int. Med.* 30: 1, 1949.
3. White, P. D.: *Heart Disease*. 3d edition. Macmillan Co., New York, N. Y. 1947. p. 750.
4. Ellis, L. B.: Mechanism of heart failure and related states. I. *New England J. Med.* 228: 284, 1943; II. *New England J. Med.* 228: 311, 1943.
5. Harrison, T. R.: *Failure of the Circulation*. The Williams & Wilkins Co., Baltimore, Md. 1937.

6. PAINE, R., and SMITH, J. R.: Mechanism of heart failure. A résumé of physiologic factors in cardiovascular failure. *Am J Med* 6: 84, 1949
7. WARREN, J. V., and STEAD, E. A. JR.: Fluid dynamics in chronic congestive heart failure. *Arch Int Med* 73: 138, 1944
8. ELLIS, L. B.: Causes and treatment of edema. *New England J. Med* 224: 1000, 1941
9. LANDIS, E. M.; BROWN, E.; FAUTEAUX, M.; and WISE, C.: Central venous pressure in relation to cardiac "competence," blood volume and exercise. *J Clin Investigation* 25: 237-255, March 1946
10. BRIGGS, A. P.; FOWELL, D. M.; HAMILTON, W. F., and REMINGTON, J. W.: Renal and circulatory factors in edema formation of congestive heart failure. *J Clin Investigation* 27: 810, 1948.
11. STEAD, E. A., JR., WARREN, J. V.; and BRANNON, E. S.: Cardiac output in congestive heart failure. *Am Heart J* 35: 529, 1948
12. VISSCHER, M. B. and JACKSON, C. E.: In *General Basic Science IV* 1949. Department of the Army
13. AITCHULE, M. D.: Pathological physiology of chronic cardiac decompensation. *Medicine* 17: 75, 1938
14. STEAD, E. A., JR.: Relation of cardiac output to symptoms and signs of congestive heart failure. *Mod Concepts Cardiovas Dis* 16: 1947
15. MERRILL, A. J.: Edema and decreased renal blood flow in patients with chronic congestive heart failure, evidence of forward failure as primary cause of edema. *J Clin Investigation* 25: 389, 1946
16. PETERS, J. P.: Role of sodium in production of edema. *New England J Med* 239: 353, 1948
17. REASER, P. B., and BURCH, G. E.: Radiosodium studies in congestive heart failure. *Proc Soc Exper Biol & Med* 63: 543 1946

## BIBLIOGRAPHY

1. BAZETT, H. C.: Blood volume and cardiovascular adjustments. *Am Heart J* 21: 423 1941
2. BEST, C. H. and TAYLOR, N. B.: *The Physiological Basis of Medical Practice* 3d edition. The Williams & Wilkins Co. Baltimore Md 1941. p 34
3. BRANNON, E. S., MERRILL, A. J., WARREN, J. V. and STEAD, E. A., JR.: Cardiac output in patients with chronic anemia as measured by technique of right atrial catheterization. *J. Clin. Investigation* 24: 332-336, 1945
4. BRANNON, E. S., STEAD, E. A., JR.; and WARREN, J. V.: Cardiac output in thyroid disease. Quoted by Stead and Warren. *Arch Int Med* 80: 237, 1947
5. BOYER, N. H.: Cardiogenic shock. I. *New England J Med* 230: 229 1944  
II. *New England J Med* 230: 256, 1944.
6. BURCH, G. E.: Disturbances of water and salt balance in congestive heart failure. *Mod Concepts Cardiovas Dis* 17: 1948
7. COURNAND, A., RILLY, R. L., BEFED, E. S.; BALDWIN, E.; and RICHARDS, D. W.: Measurement of cardiac output in man using technique of catheterization of the right auricle or ventricle. *J Clin Investigation* 24: 106, 1945
8. COURNAND, A.: Recent observations on dynamics of pulmonary circulation. *Bull N Y Acad Med* 23: 27, 1947
9. DAVIS, J. O., and SMITH, J. R.: Pathogenesis of peripheral cardiac edema. *Am J Med* 3: 704, 1947
10. FUTCHER, P., and SCHROFFER, H. A.: Studies on congestive heart failure. II. Impaired renal excretion of sodium chloride. *Am. J. M. Sc.* 204: 52, 1942

11. GIBSON, J. G., and EVANS, W. A., JR.: Clinical studies of blood volume. III. Changes in blood volume, venous pressure and blood velocity rates in chronic congestive heart failure. *J. Clin. Investigation* 16: 851, 1937.
12. GRANT, H., and REICHSMAN, I.: Effects of ingestion of large amounts of sodium chloride on the arterial and venous pressures of normal subjects. *Am. Heart J.* 32: 704, 1946.
13. HENNEMAN, P. H.: Acute pulmonary edema. *New England J. Med.* 235: 590-619, 1946.
14. HERMANN, G. R.: Blood plasma proteins in patients with heart failure. *Ann. Int. Med.* 24: 803, 1946.
15. LAUSON, H. D.; BLOOMFIELD, R. A.; and COURNAND, A.: Influence of respiration on circulation in man, with special reference to pressures in right auricle, right ventricle, femoral artery, and peripheral veins. *Am. J. Med.* 1: 315-336, Oct. 1946.
16. LOTSPICH, W. D.; SWANN, R. C.; and PITTS, R. F.: Renal tubular reabsorption of chloride. *Am. J. Physiol.* 148: 445, 1947.
17. LYONS, R. H.; JACOBSON, S. D.; and AVERY, N. L.: Change in plasma volume and body weight in normal subjects after a low salt diet, ammonium chloride and mercupurin. *Am. J. M. Sc.* 211: 460, 1946.
18. MCMICHAEL, J., and SHARPEY-SCHAFER, E. P.: Cardiac output in man by direct Fick method. *Brit. Heart J.* 6: 33, 1944.
19. MERRILL, A. J.: Mechanism of salt excretion in congestive heart failure. *Proc. Am. Federation Clin. Research* 2: 8, 1945.
20. MERRILL, A. J.; MORRISON, J.; and BRANNON, E. S.: Renal studies in chronic congestive heart failure. *Proc. Am. Federation Clin. Research* 2: 89, 1945.
21. MERRILL, A. J.; MORRISON, J. L.; and BRANNON, E. S.: Concentration of renin in renal venous blood in patients with chronic heart failure. *Am. J. Med.* 1: 468, 1946.
22. MERRILL, A. J., and CARBELL, W. H.: Effect of exercise on renal plasma flow and filtration rate of normal and cardiac subjects. *J. Clin. Investigation* 27: 272, 1948.
23. MOKOTOFF, R.; ROSS, G.; and LEITER, L.: Renal plasma flow and sodium reabsorption and excretion in congestive heart failure. *J. Clin. Investigation* 27: 1, 1948.
24. PEREIRA, G. A.: Increased plasma volume in cardiac insufficiency. Its correlation with right-sided failure. *J. Clin. Investigation* 24: 708, 1945.
25. PATTERSON, S. W., and STARLING, E. H.: On mechanical factors which determine the output of ventricles. *J. Physiol.* 48: 357, 1914.
26. PATTERSON, S. W.; PIPER, H.; and STARLING, E. H.: Regulation of heart beat. *J. Physiol.* 48: 465, 1914.
27. REICHSMAN, I., and GRANT, H.: Some observations on the pathogenesis of edema in cardiac failure. *Am. Heart J.* 32: 438, 1946.
28. ROOS, A., and SMITH, J. R.: Production of experimental heart failure in dogs with intact circulation. *Am. J. Physiol.* 153: 558, 1918.
29. STAD, E. A., JR., and WARREN, J. V.: Protein content of extracellular fluid in normal subjects after venous congestion and in patients with cardiac failure, anoxemia, and fever. *J. Clin. Investigation* 23: 283, 1944.
30. STAD, E. A., JR.; WARREN, J. V.; MERRILL, A. J.; and BRANNON, E. S.: Cardiac output in male subjects as measured by the technique of right atrial catheterization. *J. Clin. Investigation* 24: 326, 1945.
31. STAD, E. A., JR., and WARREN, J. V.: Cardiac output in man. *Arch. Int. Med.* 80: 237, 1917.

- 32 STEAD, E. A., JR.; WARREN, J. V.; and BRANNON, E. S.: Cardiac output in congestive heart failure; analysis of reasons for lack of close correlation between symptoms of heart failure and resting cardiac output. *Am. Heart J.* 35: 529-541, April 1948.
- 33 STEAD, E. A., JR.; WARREN, J. V., and BRANNON, E. S.: Effect of lanatoside C on the circulation of patients with congestive failure. *Arch. Int. Med.* 81: 282, 1948.
- 34 WARREN, J. V., STEAD, E. A., JR.; and BRANNON, E. S.: Cardiac output in man, study of some of the errors in method of right heart catheterization. *Am. J. Physiol.* 145: 458-464, Feb. 1946.



COMPARISON OF DIFFERENT REGIMENS IN THE TREATMENT OF HEPATIC CIRRHOSIS, by Gordon R. Morey, M. D., and Robert M. Kark, M. D. *Journal of Laboratory and Clinical Medicine* 34: 1727-1728, Dec. 1949.

Clinical, laboratory, and metabolic observations were made on patients with hepatic cirrhosis during treatment with different therapeutic regimens. All of the patients improved on a diet which contained (a) calories equivalent to twice the calculated basal requirement; (b) 2.5 gm. of protein per kilogram of body weight, and (c) 30 percent of the calories as fat. The patients' clinical improvement was accelerated by daily intravenous infusions of a mixed amino-acid solution which was sodium-free. Restriction of the sodium intake below 1 gm. per diem was a valuable adjuvant in combatting fluid retention. No clinical benefits were observed when the basic regimen was supplemented with cystine, methionine, choline, B complex vitamins, or parenteral liver extract. The infusion of large amounts of serum albumin was impractical as a method of protein supplementation even though a transient rise in serum albumin concentration and an increase in positive nitrogen balance attended its administration. On diet, salt restriction, and supplementation with amino-acid infusions all of the patients showed weight gains without fluid retention — *Abstract*



# Obesity as a Problem in Preventive Medicine<sup>1</sup>

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THE greatest problem in preventive medicine in the United States today is obesity. It has exceeded the combined total of the four next most common causes for rejection on medical grounds of applicants for standard life insurance (1). Table 1 shows the ideal height and weight for men and women. These weights approximate the average found in adults of medium frame between 25 and 30 years of age. To obtain ideal weights for persons with small frames subtract 5 percent and for those with large frames add 5 percent. This table makes no age distinction for adult groups because those tables that indicate progressively increasing weight with advancing years merely reflect the increasing incidence of obesity with age. As a matter of fact, there is a progressive diminution of muscle mass after the age of 25 years (2). The body weight should, therefore, be less at 50 than at 25 years.

TABLE 1.—*Ideal weights for height for adults of medium frame*<sup>1</sup>

Height (with shoes)	Weight in pounds (as ordinarily dressed)	
	Men	Women
5 feet.....		116
5 feet 1 inch.....		118
5 feet 2 inches.....	129	121
5 feet 3 inches.....	132	124
5 feet 4 inches.....	135	128
5 feet 5 inches.....	139	131
5 feet 6 inches.....	142	135
5 feet 7 inches.....	146	139
5 feet 8 inches.....	150	142
5 feet 9 inches.....	155	146
5 feet 10 inches.....	158	150
5 feet 11 inches.....	162	153
6 feet.....	167	157
6 feet 1 inch.....	172	
6 feet 2 inches.....	178	
6 feet 3 inches.....	183	

<sup>1</sup> After "Ideal Weights for Men," Statistical Bulletin, Metropolitan Life Insurance Company, 21: 6-8, June 1913, and "Ideal Weights for Women," Statistical Bulletin, Metropolitan Life Insurance Company 23: 6-8, Oct 1912

<sup>2</sup> Read before the Medical Association of the Isthmian Canal Zone, 18 January 1949

<sup>3</sup> Gorgas Hospital, Ancon, C. Z.

Tables 2 and 3, and figure 1 show that excess weight is a health hazard that carries a much greater risk in persons beyond 45 years of age than in younger persons. In fact an excess of 50 pounds at 45 increases mortality as much as valvular heart disease (3). The most favorable weight at this age is appreciably below that given in the standard tables. The preceding comparisons, unfavorable as they are to overweight persons, are based on the best of the group, namely life insurance policyholders, who had been selected by medical examination as free from any other serious physical impairment. If all overweight persons were included, their decreased longevity would be even more pronounced.

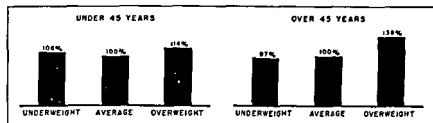


Figure 1.—Influence of weight on mortality as modified by age. (Adapted from (Neuburg (18).)

TABLE 2—Influence of weight on mortality in insured persons<sup>1</sup>

Weight	Deaths per 100,000	Percent of standard
Standard	844	100
Underweight (total)	848	101
Overweight (total)	1,111	132
Underweight, 5-14 percent	833	99
Underweight, 15-34 percent	913	108
Overweight, 5-14 percent	1,027	122
Overweight, 15-24 percent	1,215	144
Overweight, 25 percent or more	1,472	174

<sup>1</sup> After "Length of Life," by Dublin and Lotka, (14)

TABLE 3—Influence of overweight on mortality in persons aged 45 to 50 years<sup>1</sup>

Overweight	Increased mortality (above average) percent
10 pounds	8
20 pounds	18
30 pounds	29
40 pounds	45
50 pounds	56
60 pounds	67
70 pounds	81
80 pounds	116

<sup>1</sup> From "Obesity" by Neuburg, (18).

There are numerous diseases that show an increased mortality in overweight persons. These are chiefly the chronic degenerative diseases. Figure 2 shows the influence of weight on the mortality from cardiovascular renal disease. Insurance studies have shown sustained hypertension to occur more than three times as often in overweight persons as in others (4). A recent study involving 22,741 Army officers covering a 10-year period showed 2.5 times the incidence of hypertension in the overweight group (5). An even more startling correlation is seen between obesity and diabetes (fig. 3). Americans are not only the best fed people in the world, but they also have the highest death rate from diabetes of any country (6). At present there are about 2 million diabetics in the United States (7). It is estimated that one-half could be removed from this roll by weight reduction (8). If the present trend continues 3,873,000 persons who are living in 1940 either have or will develop the disease (9). Between 1900 and 1943 diabetes rose from twenty-seventh to eighth place as the primary cause of death in the United States despite the discovery of insulin (10). There is also a greater incidence of cancer in the obese person (11). The mortality from surgical procedures is higher in the overweight. Deaths from accidents are more frequent—when the fat man falls he falls harder. The incidence of biliary tract disease, joint disease, intertrigo, varicose veins, and hernia is also increased. The greater number of suicides does not agree with the common belief that the fat man is by nature jolly (14).

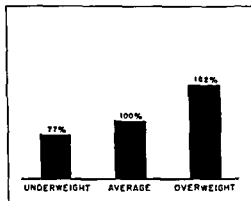


Figure 2.—Influence of weight on mortality from cardiovascular renal disease. (Adapted from Dublin and Lotka (12).)

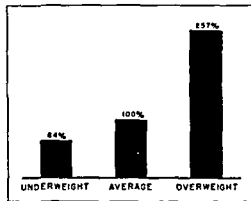


Figure 3.—Influence of weight on mortality from diabetes. (Adapted from Dublin and Lotka (12).)

*Incidence of obesity.*—In one study 2.1 percent of the men and 4 percent of the women applying for life insurance were rejected for any insurance for this reason (12). In a study of insurance policyholders, obesity was defined as more than 20 percent above the average weight. Under 25 years of age the incidence was 4.9 percent with



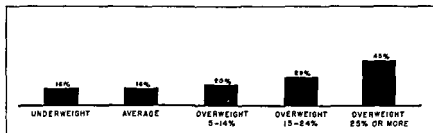


Figure 4—Relation of weight to hypertension in 594 employees of the Panama Canal. (Hypertension considered to be blood pressure of 140/90 or above)

a progressive increase to 19.8 percent at age 55 (13). The incidence in persons over 60 years of age dropped off presumably because few obese persons live beyond that age (14). In January 1949, 594 male employees of the Panama Canal received their annual physical examination. The incidence of overweight found is shown in table 4. The incidence of obesity in this group increased, progressively with age, from 7 percent between 21 and 24 years to 28 percent between 55 and 62 years. The correlation between increased weight and elevated blood pressure is shown in figure 4. Although single elevated blood pressure readings are found in many persons who do not have sustained hypertension the importance of transient hypertension as a forerunner of sustained hypertension is well known and this study demonstrates a significant increase of elevated blood pressure with increasing weight.

TABLE 4—Weight distribution of 594 employees of the Panama Canal<sup>1</sup>

15-24 percent underweight.....	10
5-14 percent underweight.....	67
Plus or minus 5 percent of the average weight.....	159
5-14 percent overweight.....	174
15-24 percent overweight.....	125
25 percent or more overweight.....	79
Percent of employees overweight.....	60
Percent of obese employees <sup>2</sup> .....	22
Average number of pounds overweight in overweight group.....	28
Average number of pounds overweight in obese group <sup>2</sup> .....	41
Expected increased mortality in overweight group.....	26
Expected increased mortality in obese group.....	50

<sup>1</sup> Ages ranged from 21 to 62 years. 55 percent were 45 years old or older.

<sup>2</sup> Persons more than 20 percent above the average weight.

*Cause of obesity.*—Although studies published 25 years ago pointed out the high mortality associated with obesity there was little medical interest in the subject largely because of the widespread belief that obese persons had some ill-defined glandular or metabolic disturb-

ance that caused them to be fat, regardless of what they ate (3). Recent studies, particularly those by Evans (2) and Newburgh (8), have established the fallacy of such beliefs. Obesity always results from the ingestion of more calories than are expended. Many obese persons state that they eat little or nothing and continue to gain. Their intake may be small in volume but not in calories. Evans (2) hospitalized a group of such patients and instructed them to continue to eat as they did at home. Their intake averaged 2,570 calories per day, and yet there was an average weight loss of 2 pounds in 4 days.

The term endocrine obesity is inaccurate. Obesity may occur in association with endocrine disease and is produced in the same way as any other obesity. Although it is known that hypothyroidism is characterized by impaired absorption of food from the intestines and that myxedematous patients are not generally obese, the idea persists that hypothyroidism is a cause of obesity (15). Plummer (16) studied 200 persons suffering from various grades of myxedema and found 61 percent were overweight. The greatest excess weight corresponded, however, to the least depression of metabolism, and those patients whose basal metabolic rates were lowest weighed the least. A few days treatment with thyroid extract resulted in diuresis with loss of edema after which their group weight was less than normal. A certain percentage of fat persons and an equal percentage of slender persons will show basal metabolic rates in the range of  $-10$  to  $-30$ . Unless there is an associated reduction of organic blood iodide, this probably represents their normal metabolic level and is not an indication for thyroid hormone therapy (17). To attribute obesity to hypofunction of the anterior pituitary is hard to rationalize in view of the severe cachexia that results from destruction of this gland. The buffalo hump and protuberant abdomen of adrenal cortical hyperfunction have been shown to be totally unrelated to adiposity, and to result from demineralization with shortening of the vertebral column (18).

Although lesions in the hypothalamus of experimental animals result in increased appetite that leads to adiposity (19), in man a positive correlation between obesity and lesions of the hypothalamus has not been established (21). It has also been claimed that fat persons digest and absorb their food with greater than normal efficiency. Such claims have been refuted (22).

The causes of obesity, therefore, are those factors that lead to excessive caloric intake. Overeating is largely a habit, both as to the amount and type of food eaten. This seems to be the largest factor in the familial incidence of adiposity. In one study patients who were given a bulky diet containing one calory per gram lost weight

(24). When given a diet containing 2.5 calories per gram all gained weight. This suggests that we become accustomed to a habitual volume of food. The importance of psychologic factors in obesity is gaining recognition. Menopausal obesity is probably a manifestation of increased leisure and boredom as well as increased nervous tension. Many persons grow fat because life has become more difficult for them and they obtain temporary solace in eating; like the alcoholic who drinks because life is too hard. In a study of 200 obese persons, Freed (25) found that 40 percent had enuresis as children and a high incidence of delayed emotional maturity. Any type of nervous tension can be an important causal factor.

### CASE REPORT

A 28-year-old woman had had a normal weight until 1 year after marriage when her husband was ordered overseas. She had been an orphan, was emotionally immature, and became depressed and extremely lonesome. When her husband returned 2 years later she had gained nearly 100 pounds. She decided her husband was ashamed of her because she was fat. She was unhappy, had frequent crying spells, consoled herself by eating, and continued to gain weight. She was treated by multiple glandular preparations including anterior pituitary extract and testosterone. When she did not improve she was hospitalized as a refractory endocrine problem. During the course of her study, the results of which were normal from a metabolic standpoint, a 600-calory diet was prescribed and she lost 40 pounds in 2 months. In the first week of treatment she had fainting spells that she attributed to lack of food. Her blood glucose was always normal at these times. Enough dextro-amphetamine sulfate was given to produce anorexia and the attacks ceased. She gradually came to recognize the fact that her polyphagia resulted from emotional stresses rather than from a physical need for food. Within 2 weeks she had become accustomed to the small meals, was encouraged by her weight loss, and the dextro-amphetamine sulfate was discontinued. She continued to lose weight after leaving the hospital.

### TREATMENT

Many patients are unaware of the threat to life that obesity entails, and they can scarcely be expected to take their condition seriously until they acquire this information. It should be re-emphasized that cardiac and renal disease, glycosuria, and hyperglycemia are urgent indications, rather than contra-indications, for radical weight reduction. If patients with these diseases are obese, weight reduction is often the most effective therapy that can be given. Foremost in the treatment of obesity is caloric restriction. Best results are obtained by definite restrictions. Hunger pangs are no worse on a 400-calory diet than on a 1,400-calory diet and the weight loss is much more gratifying. There is generally no danger from such sharp caloric restriction. Obese patients who have subsisted on 450 calories daily were found to remain in nitrogen balance if they got 60 gm. of protein daily.

One of Newburgh's (18) patients was maintained for 1 year on a 300-calory diet. He lost 286 pounds and his health was definitely improved. The patient must be convinced that hunger is a normal healthy sensation and eating should stop short of satiation. He can be assured that if he will stick with the diet for 2 or 3 days the stomach will become accustomed to the lessened intake. The diet offered should be well balanced, high in protein, but extremely low in fat and carbohydrate. Protein has the advantage of its high satiation effect. Meat with all fat removed, fish, shrimps, oysters, skimmed milk, uncreamed cottage cheese, and unsweetened gelatin may be eaten freely. Sugar and butter are restricted and bread is allowed sparingly. Desserts and pastries have no place in the diet of obese persons. Cooked fruit and coffee should be sweetened with saccharin and vegetables flavored with only salt and condiments. A 400- to 600-calory diet is usually preferred. A daily multivitamin capsule is often of value as a means of reassuring the patient that he will not develop a deficiency disease. On such a diet the average patient can be promised a weight loss of 3 to 4 pounds a week. Both patient and physician should be acquainted with water swings in which periods of eliminating water often alternate with periods of retention. Some patients may fail to show weight loss for as long as 2 weeks but this will always give way to a subsequent rapid loss so that the end result will coincide with the estimated loss.

It must be remembered that each patient is an individual problem and the effort should be made to understand and correct the factors which produce obesity. Once the desired weight has been reached, attention should be given to the establishment of dietary habits that will maintain it. It often helps to tell women that continual fluctuation of their weight predisposes to the formation of wrinkles. The patient should visit the physician frequently in the early course of dieting. Otherwise there is a tendency to postpone the dieting until the time for the patient's return visit. Having lost no weight, he is ashamed to return and decides to try some magic cure a neighbor has recommended or go to another physician.

Another approach to female patients is to tell her that she is 130 pounds of her charming self and 100 pounds of inert fat. An obese patient may also be told that for him to be fat is equivalent to carrying a neon sign stating, "I am unhappy." Thyroid extract is indicated in myxedema only. The obese patient is already metabolizing more energy than the normal person just to maintain his corpulent state. To add thyroid extract is like giving it to the thyrotoxic patient who has a basal metabolic rate of plus 50. The increased mortality in these persons is caused by the strain placed on their vital organs by the increased metabolic demands. The object of therapy is to decrease that

- 23 WILDER, R. M., and WILBUR, D. L. Diseases of metabolism and nutrition—review of certain recent contributions. *Arch. Int. Med.* 61: 297-365, Feb 1938
- 24 HARRINGTON, M. M. Appetite in relation to weight. *J. Am. Dietet. A.* 6, 101-110, Sept. 1930
- 25 FREED, S. C. Psychic factors in development and treatment of obesity. *J. A. M. A.* 133: 363-374, Feb. 8, 1947
- 26 HARRIS, S. C., IVY, A. C., and SEALE, L. M. Mechanism of amphetamine-induced loss of weight. *J. A. M. A.* 134: 1468-1474, Aug. 23, 1947.
- 27 WILLIAMS, R. H., DAUGHADAY, W. H., ROGERS, W. F., ASPER, S. P., and TOWERY, B. T. Obesity and its treatment, with particular reference to use of anorexigenic compounds. *Ann. Int. Med.* 29: 510-532, Sept. 1948



BLOOD VOLUME DETERMINATIONS IN THE UROLOGICAL PATIENT—An Adjunct in Preoperative and Postoperative Management, by Gladen E. Hamilton, *Lieutenant Colonel (MC) U. S. A.*, and Raymond J. Getz, *Major (MC) U. S. A.* *Journal of Urology* 62: 607-616, Oct. 1949

The blood volume was determined in 40 patients who were poor surgical risks. While these determinations have been employed for several decades by physiologists, only recently a method sufficiently accurate for general employment has been popularized. The Evans blue-dye technique developed mainly by Gregeresen has made possible the performance of these determinations in any well-equipped hospital. The method consists of the electrocolorimetric measurement of the intensity of a dye 10 minutes after it is injected intravenously into the patient and comparison with a known standard. Weight loss in these patients was not constantly indicative of the blood-volume deficit. Deficits in 8 patients, who apparently had lost no weight averaged 30 percent. There was no constant relationship between the blood volume and red blood cell counts, hematocrit, and hemoglobin determinations. The majority of the patients who had adequate replacement therapy recovered uneventfully following operation. In this series the correction of blood-volume deficit by whole blood transfusions was considered to be the most important single factor in the preparation of these patients for operation and their satisfactory postoperative course. The advantage of adequate replacement therapy after blood-volume determination will become more evident in the future by the reduced incidence of operative shock, postoperative wound dehiscence, infection, and poor wound healing.—*Abstract*



# Parathyroid Adenoma

## Report of Two Cases

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**P**RI-MARY hyperparathyroidism is caused by excessive formation of parathyroid hormone. This may in turn be caused by a single adenoma, multiple adenomas, a carcinoma, or idiopathic hyperplasia of the parathyroid glands. In many undiagnosed early cases of hyperparathyroidism, with a few significant symptoms, the diagnosis could have been made if estimates of blood calcium had been made as part of the clinical studies of patients having routine physical examinations (1). Norris (2) has recommended that case reports of all cases of primary hyperparathyroidism be published, with a view to clarifying the unsolved problems connected with this disease.

### CASE REPORTS

*Case 1.*—A 45-year-old soldier entered this hospital on 11 March 1949 complaining of postprandial discomfort, nausea, and vomiting of about 9 years' duration. He was hospitalized at the time of the onset and roentgenographic studies revealed a chronic duodenal ulcer. He was discharged and instructed to take a bland diet for a short time. His symptoms for the next 7 years had been mild. In November 1947 his ulcer recurred. He was transferred to this hospital in January 1948 and was again given a bland diet; and his symptoms were relieved. In October 1948 he had a severe cold and voided some dull red urine. On 20 February 1949 he had anorexia, nausea, and vomiting. He improved on a milk diet and was well until 7 March. At that time he had an aching pain in both testes associated with mild tenderness in the right costovertebral angle. Sexual excitement aggravated the testicular pain. The pain in the right costovertebral angle persisted, and was associated with oliguria, but there were no other urinary symptoms. He continued to have nausea and vomiting after eating until the time of admission to this hospital.

Physical examination revealed a blood pressure of 170/100, mild tenderness in the right costovertebral angle, and bilaterally hyperactive reflexes. The leukocyte and differential counts, the hemoglobin, and the erythrocyte count were normal. A roentgenogram of the abdomen revealed an area of calcification overlying the sacrum and right pelvis, and a recheck revealed two small areas of calcification in the region of the lower pole of the left kidney. There was also

<sup>1</sup> Letterman General Hospital, San Francisco, Calif.

an area of calcification, 13 by 0.3 cm., overlying the right side of the sacrum. A tentative diagnosis of chronic duodenal ulcer and renal calculi was made.

Phenobarbital, 0.1 gm. three times a day, tincture of belladonna, and a bland diet was prescribed. The symptoms of gastric retention were promptly controlled. On 22 March intravenous pyelograms revealed small calcifications in the lower poles of both kidneys. Function was good bilaterally with normal-appearing renal pelvis. The calyces were incompletely outlined. In the region of the lower end of the right ureter there was an oval calcification, 12 by 6 mm., that gave the appearance of a ureteral calculus. The serum calcium was 11.7 mg. per 100 cc. on 15 March, and 14.1 mg. per 100 cc. on 23 March with a serum phosphorus of 2.8 mg. per 100 cc. A diagnosis of parathyroid adenoma was made. The urologist advised the removal of the calculus in the lower third of the right ureter before exploration for the parathyroid adenoma. On 23 March under spinal anesthesia a right ureterolithotomy was performed. The patient's postoperative course was uneventful. He was transferred to the general surgical service on 2 April. His serum calcium remained around 14.1 mg. and his serum phosphorus remained around 2.4 mg. per 100 cc. His 24-hour urine contained 0.4 gm. of calcium and 0.83 gm. of phosphorus. A roentgenographic survey of the skeleton revealed no abnormalities. His serum alkaline phosphatase was 0.3 units and his acid phosphatase was 0.15 units.<sup>1</sup>

On 21 April under sodium pentothal, nitrous oxide, and oxygen anesthesia the parathyroid glands were explored. On exploring the right lobe of the thyroid numerous small nodules were noted throughout the gland. The lower pole of the right lobe was explored first in accordance with the view that this is the most common site of a parathyroid adenoma (2). In this region a red-brown mass, about 3 by 1.5 cm. was identified and separated from the lower portion of the right lobe of the thyroid by blunt dissection. It was found to have its own vascular supply and to be entirely separate from the true capsule of the thyroid. The specimen was immediately sent to the laboratory for frozen section. Following this the upper portion of the right lobe, the left lobe and the area between the esophagus and trachea was explored with no evidence of abnormal parathyroid glands. By this time a report had been received from the laboratory that the removed specimen was a parathyroid adenoma. Before closing the wound a specimen of blood was removed from the anterior jugular vein and sent to the laboratory for serum calcium and phosphorus determinations. This revealed the serum calcium to be 11.3 mg. per 100 cc. and the serum phosphorus to be 3.0 mg. per 100 cc. Postoperatively the patient had no signs of parathyroid tetany. His serum calcium gradually fell to 10.3 mg. per 100 cc. on the fifth postoperative day and the serum phosphorus remained unchanged. He regained his strength rapidly. A roentgenogram on 11 May revealed no change in the renal calculi. The patient was seen in the follow-up clinic on 14 August at which time he stated that he had not felt so well in years. His ulcer symptoms had not returned.

#### *Pathologic findings*

The specimen was a pear-shaped, relatively smooth, rubbery mass of tissue, which measured 0.4 by 1.5 by 3 cm. and weighed 3.1 gm. It was covered by a membranous capsule (fig. 1). The cut surface was homogeneous, compact, and pink-tan. Microscopically the specimen was extremely cellular and showed a thin unbroken, connective tissue capsule. The cells were arranged in cords and

<sup>1</sup>Shimowara, Jones and Reinhart method.

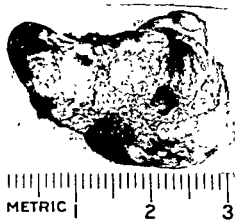


Figure 1.—Case 1. Parathyroid adenoma removed from patient.

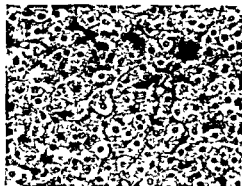


Figure 2.—Case 1. Microscopic appearance of parathyroid adenoma.

compact acini supported on a scant connective stroma, and separated occasionally by sinusoidal vascular channels. Generally, the cells presented a broad eosinophilic cytoplasm and a small dark round nucleus (fig. 2). The diagnosis was parathyroid adenoma.

*Case 2*—A 57-year-old housewife entered this hospital on 11 August 1949 with a history of back pain and lower abdominal pain of 1 day's duration. Three years before she had had an attack of right renal colic but no nausea, vomiting, or hematuria. Roentgenograms at that time revealed no evidence of calculi, but there was some evidence of a kink in the ureter. Two years before admission she had had pain in the left flank without nausea, vomiting, or hematuria. On four occasions in the week before admission she passed slightly blood-tinged urine. On the night before admission she had urinary urgency and frequency and distress in the lower midportion of the abdomen but no nausea, vomiting, or hematuria. On the day of admission she complained of lower abdominal distress and lumbar pain bilaterally.

Physical examination revealed a blood pressure of 150/85. There was tenderness in the left flank and pain in the left costovertebral angle. A tentative diagnosis of renal calculus in the left kidney was made. The leukocyte and differential counts were normal. The hemoglobin was 12.8 gm. The urine was essentially negative. On 18 August the serum phosphorus was 2.3 mg per 100 cc. and the serum calcium was 13.2 mg per 100 cc. On 12 August a roentgenogram of the abdomen showed some calcific density in the region of the left kidney. Intravenous pyelograms on 15 August revealed a calcific density in the distal extremity of the left ureter. On 19 August with a ureteral catheter in place, roentgenograms revealed the previously described opacity lying immediately to the side of the catheter in the lower one-third of the ureter.

On 19 August through a cystoscope a calculus was removed from the left ureter with an Ellik loop. A recheck of the serum calcium and phosphorus showed them to be elevated, a diagnosis of parathyroid adenoma was made. On 29 August a classical collar incision was made in the neck and exploration for adenoma of the parathyroid was performed. Exploration of the right lobe was negative. Exploration of the left lobe revealed an elliptical mass, 2.5 by 2 cm., below the lower pole of the thyroid nested in the branches of the inferior thyroid artery. Two small vessels were seen entering the upper pole of the tumor. The red-brown tumor which was slightly darker than the thyroid tissue was removed. Postoperatively the serum calcium fell and the



serum phosphorus slowly returned to normal. The patient promptly regained her strength. At no time was there evidence of tetany. She was discharged on 8 September, at which time she was completely asymptomatic.

#### *Pathologic findings*

The specimen measured 1.7 by 1.2 by 1.1 cm and weighed 1.8 gm (fig 3). Microscopic section showed partial encapsulation of cellular stroma within a loosely interwoven network of fibrous tissue elements. The cellular stroma was composed principally of closely packed cells which were segregated into acinarlike follicular arrangements by the interlacing fibrous tissue elements. The majority of the cells had dark-staining nuclei with relatively abundant cytoplasm. Occasional cells showed deep-staining acidophilic cytoplasm with multiple nuclei. The diagnosis was parathyroid adenoma.

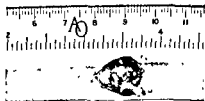


Figure 3—Case 2. Parathyroid adenoma removed from patient

#### DISCUSSION

Black (3) reviewed a series of 63 cases at Mayo Clinic in 1946 and found that the condition was almost equally distributed between the sexes (31 women and 32 men) and the highest age incidence was in the fourth decade. The weight of the adenomas varied from 0.1 to 101 gm, almost 50 percent weighing 2.5 gm or less. Norris (2) reviewing 322 cases of patients with parathyroid adenoma observed from 1903 to 1945 inclusive, noted the age incidence as being between 14 and 77 years with the maximum incidence between 40 and 50 years of age; in 317 cases there was a sex predominance of women over men in the approximate ratio of 3:1 in single adenomas and 4:1 in multiple adenomas. Of this group he found multiple adenomas in 20 instances or 6.2 percent while a single adenoma existed in 302 cases or 93.8 percent. The location of the tumor was recorded in 251 cases. In 132 cases (52.6 percent) the adenoma occurred on the right side and in 119 cases (47.4 percent) it was found on the left side of the neck. The weight of the adenoma varied from 0.4 to 120 gm. (average 12.7). The adenoma is usually well encapsulated and soft with a smooth surface. Through the capsule the adenomas often appear gray-brown. The cut surface is usually moist, homogeneous, and yellow-brown. Associated clinical findings include osteitis fibrosa and renal lithiasis alone or combined.

The signs and symptoms can best be divided into (a) those caused by hypercalcemia, consisting chiefly of muscle weakness and decreased muscle excitability such as constipation associated with nausea and vomiting, (b) those referable to the urinary tract, and (c) those referable to the skeletal system such as skeletal pain, epulides, and pathologic fracture (4).

Albright and Reifstein (5) have divided the clinical types of primary hyperparathyroidism into (a) those with bone disease and without kidney disease, (b) those with bone disease and with kidney disease, (c) those without bone disease and with kidney disease, and (d) those without bone disease and without kidney disease. With only the findings of hypercalcemia, hypophosphatemia, hypercalciuria, and hyperphosphaturia the diagnosis may be established with complete certainty (3). These characteristic findings might, however, be modified in cases of chronic renal disease with retention of metabolites, and retention of phosphorus might occur with consequent depression of the level of calcium in the blood. As the best method of establishing this Black (3) suggested that in surgical exploration for parathyroid adenomas a fairly complete dissection should be performed on the first side explored before crossing the midline. He is opposed to performing an exploration of the anterior superior mediastinum at the time when the cervical and posterior superior mediastinal exploration is performed, if the adenoma is not found in the neck. Instead he recommends performing the anterior superior mediastinal exploration after the cervical incision is well healed and after it can be demonstrated that the patient has not been cured.

The only form of acceptable therapy is complete surgical excision of the tumor. When the parathyroid glands are removed, there then results in this sequence: (a) an immediate decrease in phosphorus excretion in the urine, (b) an increase in serum phosphorus, (c) a fall in serum calcium, and (d) a decrease in calcium excretion in the urine. The patient's electrolyte patterns return to their normal state. If parathyroid extract were given to a normal person a reversal of these metabolic changes would have occurred but in the same sequence. The parathyroid hormone acts on the electrolyte equilibrium of the body fluids and the bone changes, when they occur, are secondary to the chemical changes (5). Finally Cope (6) states:

The cornerstone to successful surgery of the parathyroids is a positive diagnosis. An exploratory operation to confirm or disprove a doubtful diagnosis has little or no place in the field. The findings of the laboratory are more exact than the dissection of the surgeon, and there is no point in the operation, at which the operator may lay down his scalpel and find comfort in having disproved the diagnosis.

#### REFERENCES

1. LARLEY, F. H.: Parathyroid tumors. *S. Clin. North America* 27: 477-485, June 1947.
2. NORRIS, E. H.: Collective review; parathyroid adenoma; study of 322 cases. *Internat. Abstr. Surg.* 84: 1-41, 1947.
3. BLACK, B. M.: Surgical aspects of hyperparathyroidism. *Surg., Gynec. & Obst.* 87: 172-182, Aug. 1948.

- 4 SCHNEIDER, R W ; KYGER, E. R., JR., and McCULLAGH, E. P. Primary hyperparathyroidism; report of 10 cases. *Cleveland Clin Quart* 14: 246-257, Oct 1947
5. ALBRIGHT, F., and REIFFENSTEIN, E. C., JR. Parathyroid Glands and Metabolic Bone Disease. The Williams & Wilkins Co. Baltimore, Md., 1948
- 6 COPE, O. Surgery of hyperparathyroidism, occurrence of parathyroids in anterior mediastinum and division of operation into two stages. *Ann Surg* 114: 706-733, Oct 1941



MINIMUM POSTOPERATIVE MAINTENANCE REQUIREMENTS FOR PARENTERAL WATER, SODIUM, POTASSIUM, CHLORIDE, AND GLUCOSE, by Robert Elman, M. D.; Richard A. Lemmer, M. D.; Theodore E. Weichselbaum, Ph. D.; James G. Owen, M. D.; and Richard W. Yore, M. D. *Annals of Surgery* 130: 703-722, Oct 1949

Balance studies were carried out in 40 surgical patients on a completely intravenous intake for 96 postoperative hours, and in a few cases during several preoperative days. Study of the urinary output included volume, specific gravity, creatinine, sodium, potassium chloride, phosphate nitrogen, glucose, and acetone. Blood levels of sodium and potassium, chloride  $\text{CO}_2$  plasma, protein, and red cell volume were also measured before and after each study.

With an intake limited to 2 liters a day there was an adequate urinary output during the 4 postoperative days of about 1 liter except for a moderate oliguria during the first postoperative day. The oliguria was accompanied by a decreased creatinine excretion with no change in specific gravity.

With no electrolyte intake, the body rapidly conserves sodium and chloride, but not potassium and phosphite. The cumulative loss during 4 postoperative days averaged about 4 gm. calculated as sodium chloride and 6 gm. calculated as potassium chloride. No changes in plasma levels of sodium, potassium,  $\text{CO}_2$ , proteins, or in red cell volume were observed on this intake.

With an intake of 9 gm. of sodium chloride a day, there was a definite lag in excretion so that of the 96 gm. injected, an average of about 14 gm. was retained. The loss of potassium, however, was the same.

It is estimated from these findings that an intake of 2 liters of water plus 2 to 4 gm. of a mixture of sodium and potassium chloride (or gluconate) would meet the minimum requirements for these elements in the postoperative patient.

Calculation of the potassium-nitrogen excretion ratio suggests that only part of the potassium loss originated from the break-down of tissue protoplasm.

The nitrogen sparing effect of 200 gm. of *d* glucose was not significantly greater than 100 gm. of *d* glucose. On the other hand, because of an undoubted disturbance in carbohydrate metabolism, acetonuria was more frequent under the latter than under the former intake. Glycosuria conversely was greater with a 200 gm. intake as compared with a 100 gm. intake. In order to determine the minimum requirements for *d* glucose further observations will be necessary, particularly with regard to the influence of the rate of injection.—Abstract.



# Acute Disseminated Lupus Erythematosus

## Report of Three Cases in Young Polish Men

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FROM July 1947 to January 1948, three cases of acute disseminated lupus erythematosus were seen at the United States Naval Hospital, Philadelphia, Pa. These young men were of pure Polish extraction and all had type A blood.

A review of the literature showed no definite information concerning racial predilection for this disease. In 1942, Gahan (1), reviewing the literature for the geographic distribution of lupus erythematosus, found the incidence of the patients with new cutaneous diseases in the United States to be 0.4 percent and no appreciable difference in any part of the world except in the tropical countries where it is rare among the colored races.

### CASE REPORTS

*Case 1.*—T. L. S (2), a 35-year-old white man of pure Polish descent, had sore throats frequently as a youngster and as an adult. Five months before admission, he had sinusitis and was treated with penicillin irrigations. At this time he noticed a small erythematous macule over the left malar eminence. Three months later, he had a septic-type fever, chills, generalized malaise, abdominal pain, nausea, vomiting, and diarrhea of 8 days' duration. He believed that there was an accentuation and spread of the erythematous patch over the left cheek, bridge of the nose, scalp, and ears during this time.

Physical examination on admission showed a well-developed and well-nourished but very sick white man with the following outstanding physical findings: inflammation of the pharynx; a sinus tachycardia; and generalized abdominal tenderness.

The laboratory findings were: Hemoglobin varied from 11.5 to 12.5 gm; red blood cell count varied from 3.9 to 4.5 million; and white blood cell count varied from 5,050 to 11,200 with a slight shift to the left, type A blood; blood Kahn test and all blood cultures were negative; urine concentrated to 1015, with a slight

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trace of albumin, an occasional red blood cell, and 2 to 3 white blood cells in the sediment; blood urea nitrogen, 16.5 mg per 100 cc blood; chest roentgenogram was negative; sputa, negative for tubercle bacilli; electrocardiogram showed ST segment and T-wave changes in all leads as well as right axis deviation and the graph was consistent with acute pericarditis.

Treatment consisted of sulfadiazine 10 gm daily in divided doses, parenteral fluids, transfusions, large doses of ascorbic acid, 50 mg of pyribenzamine every 4 to 6 hours by mouth, digitalis, oxygen, and sedation.

His temperature hovered about 105° F pulse, 140 respirations, 40, and blood pressure, 120/85. Three days after admission the skin lesions were less erythematous but new lesions appeared on the buttocks. He became progressively more stuporous and dyspneic. With the onset of clinical evidence of cardiac failure, digitalis was administered. Respirations became more labored and he died 8 days after admission. Terminally, all his lesions became purpuric.

*Necropsy report*—Atypical verrucous endocarditis, myocardial fibrosis, bronchopneumonia, connective tissue degeneration around blood vessels, and wire looping of the glomerular capillaries.

*Case 2*—A J L., a 25-year-old white man of pure Polish descent, had had frequent attacks of urticaria precipitated by the ingestion of citrus fruits and tomatoes. At the age of 18, he had a reaction to tetanus antitoxin, manifested by partial collapse and urticaria. For the last 2 years his wife had noticed that he had a malar flush whenever he drank alcoholic beverages or became excited.

He was first admitted to the hospital in August 1947 because of fever and multiple joint pains. Physical examination showed an inflamed throat and several swollen phalangeal joints. Eight days after admission an abscessed tooth was removed; no change occurred in his clinical picture. Electrocardiogram was negative; blood sedimentation rates were elevated, hemoglobin, white blood cell count differential count and urinalysis were negative, roentgenograms of the small bones of the hands showed changes consistent with early rheumatoid arthritis. He was hospitalized for 27 days at this time and was discharged with instructions to receive from his physician a course of treatment with proprietary streptococcal vaccine for his arthritis.

During his 24 days at home he continued to have generalized arthralgia and fever. Two weeks before the second admission he noted an erythematous eruption on the malar areas. A week before the second admission he was told he had a similar eruption at the base of his spine. During this week while he was treated with the vaccine, he had a sore throat, chills, anorexia, nausea, and diarrhea.

The second-admission physical examination showed a very sick patient with a follicular pharyngitis, grade 2 aortic systolic murmur, sinus tachycardia, blood pressure of 112/64, and a few moist inspiratory rales at the bases. The remainder of the examination was not remarkable.

The laboratory findings were hemoglobin, from 11 to 12 gm; red blood cell count varied from 3.2 to 4.3 million; white blood cell count varied from 4,500 to 7,400 with a shift to the left, normal platelet count, coagulation, and bleeding time, type A blood, Kahn test and blood cultures were negative. Hemolytic streptococcus was cultured from the pharyngeal ulcer. Urine showed a slight trace of albumin, 2 to 6 red blood cells, and 2 to 10 white blood cells; it concentrated from 1010 to 1018, blood urea nitrogen, 14 mg per 100 cc., admission roentgenogram was negative, but final examination showed bilateral pleural effu-

sion; electrocardiogram showed low voltage and diphase QRS waves in lead 1 and 3; a biopsy of skin from the face showed changes consistent with acute disseminated lupus erythematosus.

He was treated with 100,000 units of penicillin intramuscularly every 3 hours, large doses of vitamin C parenterally, 50 mg. pyribenzamine by mouth every 6 hours, frequent blood transfusions, parenteral fluids, digitalis, oxygen, sedation, and cautery of the pharyngeal ulcer.

During this course temperature varied from 99° to 105° F.; pulse from 80 to 130; and respirations from 20 to 40 per minute. After 3 days of hospitalization he appeared to improve, but the right tonsillar ulcer was not improved. Six days after admission, there was an extension of the skin eruption to the lower anterior chest, thighs, and feet, while the face lesions were less erythematous. Eight days after admission he had a gallop rhythm and evidence of bilateral pulmonary edema. Digitalis was administered but the patient continued to be dyspneic and to fail. He died 17 days after admission.

At necropsy, there was hypertrophy, dilation, and fibrosis of the heart, atelectasis of both lungs, bilateral pleural effusion, hyalinization and thickening of the arterioles of the spleen, cirrhosis of the liver, and thickening of the capillary loops of the kidney.

*Case 3.*—F. C. Z., a 20-year-old white man of pure Polish extraction, had eczema as a child, and had diarrhea whenever he drank milk or ate tomatoes. He had recurrent hay fever since the age of 12. One year before his first admission he had an attack of hives, cause unknown.

He was hospitalized with pleurisy for 3 weeks in December 1946. During this time he was treated with one of the sulfonamides. Because of a persistent, generalized, nontender lymphadenopathy, he was sent to a naval hospital for medical observation. Heterophil agglutinations, chest roentgenograms, white blood cell counts, urinalyses, and an electrocardiogram were negative. Two lymph node biopsies showed only hyperplasia. During his stay, he had recurrent episodes of low grade fever and migratory painful joint swellings. All the blood cultures were negative. He was again treated with one of the sulfonamides as well as penicillin, with no change in the clinical picture. After 3 months of hospitalization he became afebrile, relatively asymptomatic, and was given a trial of duty. Following his discharge from the hospital, he had fatigue, anorexia, arthralgia, and a 20-pound weight loss. However, he noted some decrease in the size of lymph nodes.

Four months later he was readmitted because of tender swelling of his right knee for 1 month's duration. He had felt feverish during this attack. He denied any preceding sore throat, conjunctivitis, or urethral discharge. Physical examination showed sinus tachycardia; slight cardiac enlargement with a grade 2 mitral systolic murmur; blood pressure was 140/80; a tender swollen right knee; and generalized nontender lymphadenopathy. The clinical diagnoses considered were acute rheumatic fever or periarteritis nodosa. Electrocardiograms and antistreptolysin titer were not informative. Lymph node biopsy again showed hyperplasia. Twenty-eight days after his admission an erythematous eruption appeared on the malar areas, across the bridge of his nose, on his ears, and in his scalp. A specimen of the involved skin was taken for biopsy and changes consistent with acute disseminated lupus erythematosus were reported. He had hemorrhage into the left fundus and ptosis of the left eyelid. He continued to have a low grade fever. The facial eruption became less erythematous but more pigmented. He was sent home for convalescence but was readmitted in 6 weeks. Upon his return, he was given several blood transfusions.

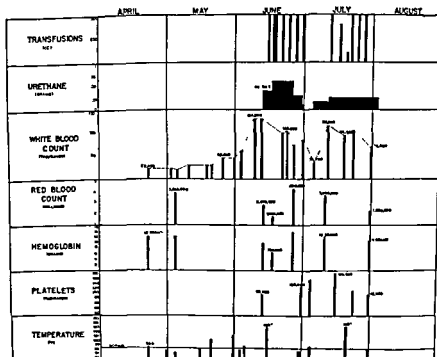


Figure 1—Hospital course.

no avail, and the patient died on 9 August 1948. Autopsy performed at the Veterans' Hospital, Hines, Ill., revealed widespread leukemic infiltration and terminal multiple spontaneous hemorrhages. Figure 1 graphically illustrates the hospital course.

#### COMMENT

The sequence of events led to speculation but no conclusion. This patient was one of three typical cases of infectious mononucleosis in this hospital at the time. The clinical course of the other two was uneventful. Of further interest is the work of Weinstein and Fitz-Hugh (4) indicating that an increase in the heterophile agglutination titer does not occur in leukemia.

#### REFERENCES

1. MINOR, G. R. Purpura hemorrhagica with lymphocytosis; acute type and intermittent menstrual type. *Am. J. M. Sc.* 192: 447, 1936.
2. TAGER, M., and KLINGHOFFER, K. A.: Acute thrombocytopenic purpura hemorrhagica with lymphocytosis; report of case. *Ann. Int. Med.* 18: 96, 1943.
3. DAMESHEK, W., and GRASSI, M. A.: Infectious lymphadenosis (mononucleosis) and thrombocytopenic purpura, recovery after splenectomy. *Blood* 1: 4, 1946.
4. WEINSTEIN, G. L., and FITZ-HUGH, T. JR.: Heterophile antibody test in leukemia and leukemoid reactions. *Am. J. M. Sc.* 190: 106-120, 1935.

# Preservation of Neurotropic Viruses

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THE advantages of 0.2 percent bovine serum albumin in buffered saline solution over animal serum, as a diluent for influenza and yellow fever viruses in infectivity titrations, were described by Dick and Taylor (1). The chief advantages are (a) ease of preparation of the albumin solution; (b) its lack of specific or nonspecific virus inactivating substances (2) (3), (c) its ready sterilization; and (d) the clearness of the solution. This laboratory later found that serum albumin solution was a satisfactory diluent for a large number of neurotropic viruses in experiments on hemagglutination because it offered a nonagglutinating medium and no loss of titer of the virus was noted in the time taken to perform the test (4). The viruses employed were: Columbia SK, Columbia MM, and Mengo encephalomyelitis; encephalomyocarditis; Eastern, Western, and Venezuelan equine encephalitis; Japanese, St. Louis, and Russian Far East encephalitis; vesicular stomatitis (New Jersey and Indiana strains); West Nile disease; rabies; lymphocytic choriomeningitis; louping ill; herpes simplex; Theiler's disease (F. A., T. O., and GD-VII strains); and poliomyelitis (Lansing and MEF1 strains). In a single preliminary test with Eastern equine encephalitis virus, it was found that virus recovered from the brain and diluted in 10 percent normal rabbit serum had an LD<sub>50</sub> titer of 10<sup>-8.5</sup> while the same virus diluted in 0.2 percent albumin solution yielded an LD<sub>50</sub> titer of 10<sup>-9.2</sup>.

It was desired to find out whether the albumin solution could replace animal serum for the preservation of neurotropic viruses for long periods of time and whether viruses in such solutions could be maintained in a mechanical refrigerator at -20° to -25° C. at sufficiently high titers (5). It has already been shown that electrically operated, mechanical refrigerators held at -20° to -25° C. have certain advantages over dry ice for prolonged preservation of certain viruses in serum suspensions. The object of this article is to describe tests on the maintenance of neurotropic viruses in the albumin solution stored

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in a frozen state in a mechanical refrigerator for varying periods of time up to 1 year.

### METHOD

Crystallized bovine plasma albumin was prepared by following the directions given by Dick and Taylor (1). For storing viruses in the frozen state a 2 percent albumin solution was used; and for their dilution, as in infectivity titrations, 0.2 percent was used. The refrigerator was of the type used by Olitsky et al (5). It was accidentally disconnected 5 months after the beginning of the test and on another occasion, 2 months later, failed to operate properly. As a consequence, the specimens were thawed twice for periods of time varying from a few hours to less than 36 hours. The viruses studied were those of Western equine encephalitis (Rockefeller Institute strain), St. Louis encephalitis (B-33 strain), lymphocytic choriomeningitis, and poliomyelitis (MEF1 strain). The neurotropic viruses were preserved in fresh, infected mouse brains made up as a 1:5 dilution in 2 percent albumin solution. Part of this was used for an initial infectivity titration. A number of the remaining specimens were placed in screw-capped nitrocellulose tubes and stored in the refrigerator which was held at  $-20^{\circ}$  to  $-25^{\circ}$  C. At 3-, 6-, 9-, and 12-month intervals each frozen suspension was thawed rapidly and an infectivity titration by the intracerebral route, in serial decimal dilutions, was made. The Swiss-W strain of mice was used for the titrations of the St. Louis encephalitis virus and the Rockefeller Institute strain was used for the others.

### RESULTS

The results of the tests (table 1) revealed that stability varies with the virus employed. After storage the MEF1 virus retained its initial  $LD_{50}$  titer at least for the entire year. The other viruses studied were not so stable. The infectivity of Western equine encephalitis virus held up well for 9 months but after 12 months exhibited a drop of almost 3 logarithmic units from its initial titer. St. Louis encephalitis virus retained its  $LD_{50}$  titer during 3-month storage but

TABLE 1—Effect of storage of 1:5 virus suspensions in 2 percent albumin solution on infectivity titer

Virus and original $LD_{50}$ titer	$LD_{50}$ titer after storage			
	3 months	6 months	9 months	12 months
Lymphocytic choriomeningitis $10^{-4.5}$	$10^{-4.5}$	$10^{-3.5}$	$< 10^{-2.5}$	-----
Lymphocytic choriomeningitis $10^{-5.5}$	$10^{-5.5}$	$10^{-5.5}$	$10^{-5.5}$	-----
Western equine encephalitis $10^{-7.5}$	$10^{-6.5}$	$10^{-6.5}$	$10^{-7.5}$	$10^{-4.5}$
St. Louis encephalitis $10^{-7.5}$	$10^{-7.5}$	$10^{-7.5}$	$10^{-7.5}$	$10^{-4.5}$
Poliomyelitis (MEF1) $10^{-9.5}$	$10^{-9.5}$	$10^{-9.5}$	$10^{-9.5}$	$10^{-9.5}$

was reduced about 2 logarithmic units after 6 months and was still infective after 1 year. The infectivity of the virus of lymphocytic choriomeningitis, however, fell off at 3 months and was greatly reduced after 6 months.

#### SUMMARY

The level of infectivity titer exhibited during prolonged storage in a frozen state at  $-20^{\circ}$  to  $-25^{\circ}$  C., and suspended in 2-percent bovine plasma albumin in buffered saline solution, varies with different viruses. The poliomyelitis MEF1 virus retained its original titer throughout a year while lymphocytic choriomeningitis virus showed a decrease at 3 months, the St. Louis encephalitis virus at 6 months, and the Western equine encephalitis virus at 12 months. The effect of two accidental thawings on the titer is unknown and it is not known what the results might have been if dry ice had been used instead of a mechanical refrigerator. All the viruses could be recovered by animal passage after storage for 6 to 12 months. Olitsky et al., using an adequate amount of normal rabbit serum instead of albumin solution for the preservation of certain neurotropic viruses in a mechanical refrigerator, recorded a definite reduction in titer of some of them at 3 and 9 months (5). The method here described for preserving viruses is applicable to conditions in which a buffered saline solution of bovine plasma albumin is desired as a substitute for animal serum, preserved in a refrigerator. The variations in the preservation of the viruses here studied would indicate that a pattern of infectivity after storage must first be determined for each virus before the method is generally adopted.

#### REFERENCES

1. DICK, G. W. A., and TAYLOR, R. M.: Bovine plasma albumin in buffered saline solution as a diluent for viruses. *J. Immunol.* 62: 311-317, July 1949.
2. GINSBERG, H. S., and HORSFALL, F. L., JR.: A labile component of normal serum which combines with various viruses. *J. Exper. Med.* 90: 475-495, Nov. 1949.
3. OLITSKY, P. K., and CASALS, J.: The effect of incubation at  $37^{\circ}$  C. on the neutralization test with various encephalitis viruses including Lansing strains of poliomyelitis virus. *J. Immunol.* 60: 487-496, Dec. 1948.
4. OLITSKY, P. K., and YAGER, R. H.: Hemagglutination by Columbia SK, Columbia MM, Mengo encephalomyelitis and encephalomyocarditis viruses; experiments with other viruses. *Proc. Soc. Exper. Biol. & Med.* 71: 719-724, Aug. 1949.
5. OLITSKY, P. K.; CASALS, J.; WALKER, D. L.; GINSBERG, H.; and HORSFALL, F. L., JR.: Preservation of viruses in a mechanical refrigerator at  $-25^{\circ}$  C. *J. Lab. & Clin. Med.* 34: 1023-1026, July 1949.



wrinkled. He shivered intensely and kept curled up as tightly as possible. Examination of the lungs revealed no abnormality although auscultation was difficult because of the muscular tremor. There was difficulty in determining the size of the heart and a cardiac impulse could not be felt. The sounds were indistinct and the rhythm absolutely irregular with an average rate of 68. No murmurs were heard. The blood pressure was 100 mm Hg systolic and 60 diastolic. An electrocardiogram (fig 1) showed auricular fibrillation with the ventricular rate averaging about 75 a minute. The baseline was irregular, due to body tremor. The S-T junction was slightly elevated in lead 1 and the T waves were nearly isoelectric in this lead but upright in leads 2 and 3.

The patient after being given an ounce of alcohol, hot coffee, and ephedrine (72 mg intramuscularly) was gradually warmed under blankets. He responded quickly to therapy and 8 hours after admission he was ambulant. He rested the following day, then returned to work.

Eighteen days later he was asked to return for reexamination. He appeared to be 10 years younger than he did on the first admission and stated that he felt well. The heart was not enlarged and the apical thrust was easily palpable. The sounds were distinct, of good quality and no murmurs were heard. The rhythm was normal at a rate of about 72. The blood pressure was 110 mm Hg systolic and 64 diastolic. The remainder of the examination revealed no abnormalities. An electrocardiogram taken at this time (fig 2) showed normal rhythm at a rate averaging about 65. The T waves were now tall and upright in lead 1.

### DISCUSSION

The general features of this case illustrate the fact that persons who are not far from death as the result of hypothermia may be quickly restored to their previous state of health. In this regard, cold is almost unique among injurious agents and the explanation is largely to be found in the lowered metabolic activity of the body cells.

The effects of cold on the heart which were observed in our case were diminution in intensity of the heart sounds, feeble heart action, auricular fibrillation with slow ventricular rate, and lowering of the T-wave changes in the electrocardiogram may occur as the result of cooling the heart locally (5) (6) or of generalized hypothermia (7). Clinical studies suggest (8) and pathological studies show (7) that these T-wave changes may occur in the absence of structural damage to the myocardium.

With regard to the auricular fibrillation, two features are worthy of special notice, namely, the slow ventricular rate and the spontaneous return to normal rhythm. The former implies a considerable degree of auriculoventricular block which is probably caused by the direct effect of cold on the heart. The possibility of vagus overactivity must be considered but Tomaszewski (9) has shown that in animals, at least, slowing of the heart as the result of hypothermia may be independent of vagal activity. The spontaneous return to normal rhythm is characteristic in these cases.

The appearance of auricular fibrillation under conditions of hypothermia has not been satisfactorily explained. Vagus overactivity and alteration in the chemical and endocrine constituents of the blood have been mentioned as possibilities. However, there is no proof that any of these are important etiologic factors. One possibility that has not received attention is that, in contrast to many other organs, the heart must do considerable work regardless of how low the body temperature falls if the person is to survive. However, a point must be reached when the metabolism of heart-muscle cells is sufficiently reduced or otherwise interfered with so that contractility is faulty. This amounts to a local cause for failure and offers a reasonable explanation for the appearance of fibrillation in the auricles.

#### SUMMARY

A previously healthy young man nearly perished from hypothermia as the result of accidental immersion in cold water. Auricular fibrillation was among the clinical findings.

#### REFERENCES

1. TALBOT, J. H.: Physiologic and therapeutic effects of hypothermia. *New England J. Med.* 224: 281, 1941.
2. ALEXANDER, L.: Treatment of shock from prolonged exposure to cold especially in water. Office of the Publication Board (Report No. 250) Dept. of Commerce, Washington, D. C.
3. TOMASZEWSKI, W.: Changements électrocardiographiques observés chez un homme mort de froid. *Arch. d. mal. du cœur.* 31: 525-528, May 1938.
4. WAYBURN, E.: Immersion hypothermia. *Arch. Int. Med.* 79: 77, 1947.
5. WILSON, F. N., and FINCH, R.: Effect of drinking lead water upon the form of T deflection of the electrocardiogram. *Heart* 10: 275, 1923.
6. KISCH, B., and GROFF, F. M.: Changes in electrocardiogram due to local cooling of chest wall. *Cardiologia* 4: 206, 1940.
7. SANO, M. E., and SMITH, L. W.: Critical histopathologic study. *J. Lab. & Clin. Med.* 26: 443, 1940.
8. KOSMAN, C. E.: General cryotherapy: a symposium; cardiovascular aspects. *Bull. New York Acad. Med.* 16: 317, 1940.
9. TOMASZEWSKI, W.: Etudes électrocardiographiques sur les animaux soumis à la réfrigération. *Arch. d. mal. du cœur* 31: 730-737, July 1938.



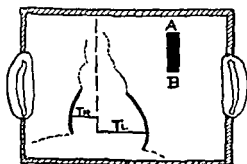
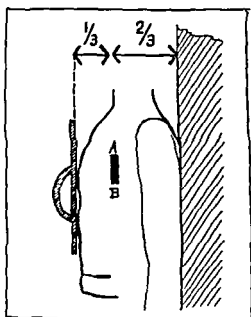
# Orthodiascopic Measurements During Fluoroscopy

## A Device

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A VARIETY of procedures have been devised for the roentgenographic estimation of heart size but most of these have certain drawbacks which are well considered in various texts on cardiology such as the third edition of White's "Heart Disease." Even in teleoroentgenograms there is a distortion from divergent rays amounting to 5 to 8 percent depending on the tube-film and object-film distance. As a consequence the tables and nomograms for the prediction of normal teleoroentgenographic values differ from those for orthodiascopic reference. Furthermore the wide range of the normal heart size and shape in correlation with height, weight, and body surface area, makes the rigid application of so-called normal standards to borderline cases extremely hazardous. However, there is some merit in any simple procedure which introduces a quantitative element into clinical evaluations provided it is not slavishly followed.

The device described permits correction for the distortion of the ordinary vertical fluoroscopic image so that the actual transverse diameter of the heart may be recorded for comparison with tables of orthodiascopic normals or with subsequent observations on the same patient. It is a modification of Gubner and Ungerleider's method (1) for measuring heart size in miniature films and any credit for originality is entirely theirs. This modification eliminates the markings on the lead scale which are hard to read on the fluoroscopic screen and does away with the bracket for the support of the lead scale. It also avoids disturbing the screen-tube relationship when the patient, in the original method, steps aside to permit projection of the scale on the screen. Both methods are based on the assumption that a radio-paque body in the same plane as the heart will be enlarged on the fluoroscopic screen to the same extent as the heart shadow. The heart plane is usually one-third of the distance from the front to the



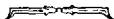
$$\frac{T_R + T_L}{X} \approx \frac{AB}{50\text{mm}}$$

Figure 1.

this diagram, along with the image of the lead standard of reference, transferred to tracing paper for future comparison. It is important that the ribbon be attached to the chest in a vertical plane as obliquity will introduce serious distortion.

## REFERENCE

1. GURNER, R., and UNGERLIDER, H. L.: Measurement of heart size in miniature roentgenograms and a substitute for teleroentgenography and orthodiascopy. *Am J. Roentgenol.* 52: Oct. 1944.



# Continuous Spinal Anesthesia: The Ureteral Catheter (Tuohy) Technique

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IN 1939, Lemmon (1) described the first method for administering continuous (fractional) spinal anesthesia. He used an indwelling malleable needle in the subarachnoid space. In 1944 Tuohy (2) (3) (4) reported a second method in which a ureteral catheter was threaded into the subarachnoid space through a large gage spinal needle, this needle being immediately withdrawn. The primary objective of the Tuohy method was to overcome technical difficulties of the former technique such as: (a) relative ease of dislodgement of the malleable needle; (b) trauma to the tissues incident to leaving the needle in place; (c) remote hazard of breaking the needle in the tissues, and (d) need for a special mattress. Since the malleable needle technique has been evaluated by many investigators (5) (6) (7) (8) (9) (10) (11) (12) (13) (14), it was decided to study the catheter technique used at the United States Naval Hospital, Philadelphia, Pa., during 1947 and 1948. This article is a review of over 250 cases in which the ureteral catheter method was used for surgical anesthesia and also for several diagnostic and therapeutic procedures.

## TECHNIQUE

*Method.*—The patient is placed in the lateral recumbent position for the lumbar puncture. The skin is cleaned with ether and tincture of merthiolate. After draping, a 1 percent procaine skin wheal is made over the lumbar interspace to be entered (usually the third, occasionally the fourth, and, rarely, the second.) Following infiltration of the interspinous ligament with 1 percent procaine, a 16-gage, 3½-inch Huber-point needle is introduced into the subarachnoid space. The needle is directed cephalad so that it makes an angle of approximately

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45° with the patient's back. As soon as clear flow of spinal fluid is obtained a graduated 3.5 Fr. ureteral catheter containing a wire stylet is threaded through the needle until it reaches the Huber point (care being taken not to lose an excessive amount of spinal fluid during this maneuver). The wire stylet is then slowly withdrawn as the catheter is simultaneously advanced beyond the point of the needle into the subarachnoid space for a distance of 4 to 5 cm. The stylet is then entirely removed, and the spinal needle withdrawn, leaving the catheter in place. If the catheter is properly introduced into the subarachnoid space, spinal fluid will drip freely from it. If, however, spinal fluid cannot be aspirated easily, the catheter is removed and reinserted because it is believed that the few failures early in the series were due to placing the catheter in the epidural space. When a paresthesia is noted on inserting the catheter and when it cannot be overcome by slight turn of the needle, the catheter and needle are withdrawn and reintroduced. On occasion the catheter cannot be passed beyond the end of the needle, apparently because of obstruction by the vertebral body when the needle is too far into the canal. This difficulty is encountered more frequently when the needle is perpendicular to the back rather than when in a somewhat cephalad direction. The catheter, once it has been threaded beyond the point of the needle, must not be withdrawn, otherwise the Huber point may be sheared off within the subarachnoid space. When the catheter is satisfactorily in place it is connected to a 10 cc. Luer-Lok syringe and stopcock by means of a Borst adapter, and then fixed to the patient's back with adhesive tape. A small gauze pad is placed at the point where the catheter enters the skin to prevent kinking. The patient is then put into the desired position for injection of the anesthetic solution.

#### DRUGS

(a) *Preoperative medication.*—Most patients in the series receive pentobarbital sodium (0.1 gm.) the night before and the morning of the operation. Morphine sulfate and scopolamine (or atropine sulfate) in a 25:1 ratio are given routinely 1 hour before operation.

(b) *Pressor agents.*—Ephedrine sulfate (25 to 50 mg.) is given intramuscularly as a prophylactic measure 2 to 5 minutes before the initial injection of the anesthetic agent. If subsequent vasopressor activity is required ephedrine, neosynephrin, or desoxyephedrine is given intravenously.

(c) *Anesthetic agents.*—For the surgical cases 4 cc. of 1 percent pontocaine hydrochloride are diluted with 6 cc. of 10 percent dextrose so that each cubic centimeter of the mixture contains 4 mg. of pontocaine. The initial dose is from 4 to 16 mg. (average 12 mg.) depending on the physical state of the patient and the operation proposed.



patient and to minimize disturbance to the surgeon due to retching and straining by the patient. Table 3 shows a review of the cases according to the supplemental agents used. Some 20 percent were sufficiently quiet following the preoperative medication to require no further hypnosis. Fifty-two percent received intravenous injections of morphine sulfate and scopolamine (25:1 ratio). It was found that these agents were most effective when given a few minutes before excessive abdominal traction was made. Pentothal sodium was given either in 0.5 percent solution by slow drip or in 2.5 percent concentration by small divided doses. A combination of pentothal-nitrous oxide-curare was given in 2 cases where subsequent doses of spinal anesthesia were impossible because of a kink in the catheter, and in 3 cases where the anesthesia failed because the catheter did not enter the subarachnoid space. Cyclopropane was used in 6 percent. Whenever, during the course of the operation, there was severe hemorrhage (4 cases) or shock (1 case) further use of spinal anesthesia was deferred and the operation was completed under cyclopropane-curare. Cyclopropane in small amounts was found to be the agent of choice in controlling hiccups during gastric surgery.

TABLE 3—*Supplemental anesthesia*

Agent	Indication	Number of cases	Percent
Morphine sulfate and scopolamine	Sedation and hypnosis	128	52
Pentothal sodium	Excessive restlessness	23	9
	Augment effects of morphine	14	6
	Surgeal anesthesia with nitrous oxide and curare	5	2
Nitrous oxide	Analgesia and hypnosis	11	5
Cyclopropane	Surgical shock	5	2
	Hiccups	3	1
	Incomplete spinal	1	1
	Hypnosis	5	2
None		51	20
		250	100

### COMPLICATIONS

Postspinal headache which occurred in 41 cases (16 percent) was the most common complication observed in this series. Our criteria for a postspinal headache were as follows. A headache coming on after spinal anesthesia, different in character from any headaches that the patient might have had previously, which was aggravated in the upright position and relieved in the recumbent position. In 31, the

headache was of less than 5 days duration and in 10 it lasted up to 12 days. The average for the group was 4.7 days. Although it was difficult to evaluate the severity of the headache, 9 were classified as mild, 25 as moderate, and 7 severe. In 2 with most severe headache there was associated meningismus but smear and culture of the spinal fluid failed to reveal any organisms. The fluid did, however, appear xanthochromic.

An attempt was made to determine if any relationship existed between postspinal headache, type of operation, and age of the patient. As table 4 indicates, there was no correlation between type of operation (upper or lower abdominal) and the occurrence of headache (columns 3 and 4). However, it was noted that the younger patients

TABLE 4—Headache following continuous spinal anesthesia

Operation	Number having headache	Percent of total	This operation percent all operations	Average age for operation	Average age with headache
Gastrectomy . . . . .	15	35	32	47	40
Cholecystectomy . . . . .	9	22	15	43	38
Small bowel surgery . . . . .	5	12	8	47	39
Large bowel surgery . . . . .	1	2.5	15	48	33
Exploratory laparotomy . . . . .	4	10	8	48	36
Other operations . . . . .	7	15.5	22	46	46
Total . . . . .	41	100	100	46	40

were prone to develop spinal headaches. The age mode for the series was 51 to 55 years, but the age mode for patients with spinal headache was 35 to 40 years. Furthermore, the average age of a patient having a particular operation was higher than the average age of the patient having that operation and developing a spinal headache (columns 5 and 6 of table 4). In the group that had multiple continuous spinal anesthetics one patient developed headaches following both and one patient had a headache after the first but not after the second operation.

In our series there were no deaths resulting from anesthesia alone.

In the present series where supplemental anesthesia was used freely, the incidence of pulmonary complications appeared to be the same as in the series of Lemmon and Paschel (6) in which no supplemental agents were used.

One patient had total spinal anesthesia following the initial dose (10 mg). Respiration ceased but she reacted after 45 minutes of artificial respiration during which time her blood pressure and pulse remained normal; the operation was continued. Upon discharge from the hospital she had no apparent ill effects.

Two patients had backache at the site of lumbar puncture not related to trauma during anesthesia. This condition cleared up with-

in a period of 3 months. In no instance did local infection develop at the site of the catheter.

There were two cases of transient residual paresthesia and muscle weakness. In both there was extreme paresthesia at the time of insertion of the catheter through the needle so that the needle was withdrawn and reintroduced at a different interspace. One of these had persistent muscle weakness for about 4 months. The other continued to have hypesthesia and muscle weakness 3 months after the operation, but showed definite improvement with physiotherapy.

#### FOLLOW-UP

One hundred and seventy-five patients in this series were seen from 2 to 18 months following operation. Of these, 26 have died as a result of primary disease (mostly carcinoma) and 5 of other causes. The remaining patients were well and had no complaints referable to the anesthesia except the patient previously mentioned.

#### DISCUSSION

The ureteral catheter (Tuohy) technique of administering continuous spinal anesthesia has proved to be a simple, inexpensive method with certain advantages. First, the catheter can be introduced with the patient on a carrier or bed. This makes the method adaptable to many diagnostic and therapeutic measures. Second, the catheter is introduced far enough into the subarachnoid space to insure that it will not be dislodged by movement of the patient. This permits more freedom in handling the patient and gives more certainty of satisfactory anesthesia with subsequent doses.

There are some theoretical disadvantages to the method. First, it is possible to introduce the catheter into the epidural space and obtain inadequate anesthesia. This can be easily recognized by the failure of spinal fluid to drip from the catheter, and can be remedied by reinsertion. Second, the catheter can kink as the patient lies on it, but this is rare if sufficient care is taken to tape it in place properly. Third, the catheter may be sheared off. To our knowledge no such incident has been reported. Fourth, there is an ever-present danger of local infection, but we have seen no evidence of this even in a case where the catheter was in place for 72 hours. Lastly, there is a high incidence of transient paresthesia at the time of insertion of the catheter but there has not been a correspondingly high incidence of residual paresthesia.

The use of light supplemental anesthesia was found to enhance the patient's comfort, and by its inhibition of reflex nerve-impulses makes for smoother operating conditions.

Residual transient paresthesias were encountered in two cases. This has also been reported following the use of the malleable needle by Apgar (12) and Hale and Shaar (14).

The incidence of postspinal headache was 16 percent in this series. Hale and Shaar (14) using the malleable needle technique at this hospital in 1940 to 1943 encountered this complication in 11 percent of their cases. The incidence of headache following "single dose spinal" in this hospital has been 9 percent. Moreover the incidence has been reported as less than 2.5 percent following the use of the malleable needle by Lemmon and Paschel (6) (11), Apgar (12), and Ansburo and Pico (10). On the other hand Cann and Wycoff (18) using a slight modification of the catheter technique reported headache in 30 percent. It would appear that the incidence of spinal headache following the use of the catheter is higher than with the malleable needle or with the conventional spinal needle. If one of the factors causing spinal headache is the leakage of spinal fluid through the hole in the dura, it would seem that the large hole made by the 16-gauge needle would leak more fluid than either of the others which are smaller. Another factor in this higher incidence may be the vigorous early ambulation of recent years which would account for the manifest headaches during the first few days following operation.

#### REFERENCES

1. LEMMON, W. T.: Method for continuous spinal anesthesia. *Ann Surg* 111: 141-144, Jan. 1940.
2. TUOHY, E. B.: Continuous spinal anesthesia: its usefulness and technic involved. *Anesthesiology* 5: 142-148, March 1944.
3. TUOHY, E. B.: Use of continuous spinal anesthesia utilizing ureteral catheter technic. *J. A. M. A.* 128: 262-264, May 1945.
4. TUOHY, E. B.: Continuous spinal anesthesia: new method utilizing ureteral catheter. *S. Clin. North America* 25: 834-840, Aug. 1945.
5. NICHOLSON, M. J.: Continuous spinal anesthesia. *Lahey Clin. Bull.* 2: 34-47, Oct. 1940.
6. LEMMON, W. T., and PASCHEL, G. W.: Continuous spinal anesthesia with observations on first 500 cases. *Pennsylvania M. J.* 44: 975-981, May 1941.
7. NICHOLSON, M. J.; EBERSOLE, U. H.; and HAND, L. V.: Fractional spinal anesthesia. *Am. J. Surg.* 53: 403-411, Sept. 1941.
8. BURFORD, G. E., and GALVIN, W. H.: Observation on continuous spinal anesthesia. *New York State J. Med.* 42: 54-58, Jan. 1942.
9. HAUGEN, F. P.; RUTH, H. S.; and TAYLOR, I. B.: Serial spinal anesthesia. *Anesthesiology* 3: 52-60, Jan. 1942.
10. ANSBURO, P., and PICO, L. J.: Continuous spinal anesthesia (report of 1,000 cases). *Am. J. Surg.* 55: 504-508, March 1942.
11. LEMMON, W. T., and PASCHEL, G. W.: Continuous, serial, fractional, controllable, intermittent spinal anesthesia. *Surg., Gynec. & Obst.* 74: 948-956, May 1942.
12. APGAR, V.: Continuous spinal anesthesia. *Anesthesiology* 3: 522-523, Sept. 1942.

the bladder caused by lower urinary tract obstruction and are more properly designated vesico-umbilical fistulas.

*Incidence.*—Cross (3), in 1935 collected only 96 cases of cysts from the literature. A true patent urachus, congenital or acquired, had been found only in 3 instances in 15,000 admissions to the Brady Urological Institute. Other urachal abnormalities are more rare. The reported incidence of urachal anomalies is subject to question in many instances because of the improper diagnosis of vesico-umbilical fistulas. Herbst (4) found only 148 recorded cases of patent urachus. In 200,000 admissions to the Childrens and Infants Hospital, Boston, Mass., there were 3 cases of patent urachus (5). Campbell reported 15 such cases in 12,080 autopsies on children. The ratio of men to women with this condition is 2:1 (6).

*Pathology.*—There are four principal types of urachal anomalies: (a) complete (patent throughout from bladder to umbilicus); (b) blind external (patent at the umbilical end only); (c) blind internal (patent at vesical end only); and (d) blind end (cyst, the most common type).

Dudgeon (6) listed 8 types of urachal pathology: (a) exstrophy of the bladder; (b) patent urachus; (c) patent urachus and omphalomesenteric duct (4 cases); (d) malignancy (45 cases of mucinous carcinoma (7)); (e) cysts which may weigh as much as 100 pounds; (f) abscess (most common); (g) calculus (4 cases); and (h) tuberculosis (1 case). Pesqueira and Engelking (8) reported 1 instance of actinomycosis.

*Symptoms* causing a patient to present himself for treatment are almost uniformly those associated with infection. Lower abdominal pain and tenderness are the most common complaints. A suprapubic mass with or without drainage from the umbilicus is frequently present. Gastrointestinal symptoms may predominate suggesting that peritoneal involvement has occurred and that perforation into the peritoneal cavity is imminent (9). Dysuria and pyuria suggest bladder communication.

The *diagnosis* of urachal disease is not easy. The more important conditions to consider in differential diagnosis are: (a) appendiceal abscess; (b) ascites; (c) ovarian cyst; (d) distended bladder; (e) pregnancy; (f) diverticulitis; and (g) patent omphalomesenteric duct (10). The diagnosis is established by cystoscopy, cystography, and radiographic demonstration of a tract by injection through an umbilical opening. Roentgenograms to determine the presence or absence of abnormal soft tissue shadows, and the absence of a tract extending intraperitoneally, may assist in definite differentiation (11) (12).

The *treatment* of urachal anomalies is always surgical. The infected cyst should be incised, drained, and excised later (13). Pri-

mary excision is the procedure of choice for large uninfected cysts, malignancy, tuberculosis, and draining urachal fistulas. The added protection of sulfonamides and antibiotics may permit a more radical primary approach than was possible in the past.

### CASE REPORT

A 30-year-old officer was admitted to this hospital on 25 December 1948 complaining of fever, mucopurulent drainage from the umbilicus of 4 weeks' duration, and pain and swelling of the lower abdomen of 3 weeks' duration. At the age of 13 years he had frequency of urination and periumbilical pain which subsided without treatment. During the current episode umbilical irrigations with penicillin were given at an Air Force station hospital. These gave temporary relief. With the onset of pain he was given penicillin in oil with no improvement. At no time were there symptoms of bladder irritation.

On admission his temperature was 101° F. The leukocyte count was 10,300 per cu. mm. The urine was normal. The abdomen was moderately distended, voluntary rigidity with severe periumbilical and infraumbilical tenderness was present. There was a moderate amount of foul-smelling purulent discharge from the umbilicus and a probe could be inserted 3 cm. caudad through the small umbilical opening. Four centimeters below the umbilicus there was a tender mass about 5 cm. long but with ill-defined lateral margins. Nonhemolytic *Staphylococcus albus* and *Streptococcus* were cultured from the umbilical sinus. A tentative diagnosis of an infected urachal remnant of the blind external type, or of an omphalomesenteric duct was made.

Intravenous pyelograms were normal. Cystoscopic examination revealed no evidence of a urachal opening. Injection of the umbilical tract with a contrast medium showed a narrow tract extending distally in the midline of the abdominal wall for a distance of 3 cm. ending in a sacculi 2.5 cm. in diameter.

Three days following admission the infraumbilical mass was explored. The peritoneal cavity was entered through a right paramedian incision. For a distance of 1 cm. on either side of the midline the peritoneum and omentum were densely adherent to the anterior abdominal wall. The inflammatory mass was continuous with the bladder wall but did not enter the vesical cavity. The mass was removed by sharp dissection including the involved peritoneum, omentum, and umbilicus. Drains were placed in the prevesical space. Closure of the posterior rectus abdominis sheath and transversalis fascia was accomplished with difficulty because about 2.5 cm. of the peritoneum and adjacent structures had been excised. The postoperative diagnosis was abscess of a patent urachus. This was confirmed by pathologic examination.

Both penicillin and streptomycin were administered postoperatively. The course was smooth until the fifth day when the patient, while straining on the bed pan, split the lower portion of the abdominal wound through the anterior rectus abdominis sheath. The wound was closed and the patient was able to take sick leave on the sixteenth postoperative day. Examination 1 month later showed him completely free of symptoms with the abdominal wall well healed.

### DISCUSSION

This case represents the most common of urachal anomalies consisting of a cyst of the urachal remnant. The umbilical sinus communicating with the abscess cavity may represent the portal of entry of

off; they may be absorbed or else persist and form cysts. They also state that definite proof of their theory "will come when someone is able to find a carcinoma developing in one of these cysts." In 1940 Peterson (6) reported an embryonal carcinoma of a mesenteric cyst in a 55-year-old white man.

Many classifications of mesenteric cysts have been offered. Peterson (6) divides all cysts of the mesentery into two groups. Under the first or embryonic group he includes: (a) Cysts arising from embryonic remnants and sequestered tissue which include serous, chylous, sanguineous, and dermoid cysts; (b) cysts arising by sequestration from the bowel, including Meckel's diverticulum; and (c) cysts of urogenital origin.

In Peterson's second group (pseudocysts) are included (a) those of infective origin, hydatids, and cystic degeneration of tuberculous nodes; and (b) cystic malignant disease.

Ladd and Gross (4) believe that true mesenteric or lymphatic cysts should be differentiated from cysts of enteric origin. They point out that these two types differ both as to their pathological picture and treatment.

The enteric cyst is a thick-walled structure with a serous coat, two layers of smooth muscle, and a mucous membrane lining, while the mesenteric cyst is thin-walled and has no muscular coat or mucosal lining. The wall of the latter consists of connective tissue; in some specimens there is a layer of flattened endothelial cells on the inner surface. These two authors further emphasize that anatomically the musculature of the enteric cysts is intimately associated with that of the intestine, and that its blood supply is the same as that of the adjacent gut. Consequently the enteric cyst cannot be removed without injury to the intestine and destruction of the blood supply of that particular segment. On the other hand, although the mesenteric cyst may lie against the mesenteric surface of the intestine "there is a line of cleavage between the two" so that the cyst can usually be removed without injury to the bowel or its blood supply.

On the basis of content, mesenteric cysts are of two types, serous or chylous. Those containing chylous fluid generally arise from the mesentery of the jejunum, where the maternal draining from the intestinal tract contains a high percentage of fat. The content of the serous cysts is similar in chemical composition to blood plasma.

Mesenteric cysts have been found in both infants and adults, the oldest reported patients being over 60 years of age (2). Incidence is highest in the fourth decade and lowest in the first and sixth. These cysts occur twice as frequently in women as in men (2) and occur mainly in members of the white race, although one has been reported in a Chinese boy (7).

Clinical symptoms due to mesenteric cysts are extremely variable depending upon the location of the tumor. They occur in any part of the mesentery but the jejunum and ileum are the most frequently involved. Occasionally smaller cysts may accompany the main one and confuse the clinical picture.

Warfield (2) has pointed out that these tumors are extremely mobile, especially in the transverse direction because of the nature of the mesenteric attachment, and that pain occurs more frequently than with any other type of abdominal cystic tumor. The size of the cyst and the pressure it exerts on neighboring viscera is another factor which may influence the clinical picture.

In a series reported from the Mayo Clinic (5) it was noted that "cysts with less than 2.5 cm. diameter failed to produce any physical signs or symptoms." However, these authors suggest that a sudden hemorrhage into a small cyst or twisting of its pedicle may produce an acute abdominal crisis.

Large cysts though incompletely filled and of soft consistency can, by their "saddle-shape structure" (4), compress or strangle adjacent intestine. The picture is that of partial or complete intestinal obstruction with chronic or acute symptoms, no different from those seen in obstruction from any other cause.

Tuberculous peritonitis is the diagnosis most frequently made pre-operatively when the cyst produces a painless abdominal enlargement. These tumors are difficult to palpate and demarcate because of their flaccidity. With large cysts it may be possible to elicit a fluid wave.

Roentgenological study, including films of the abdomen, gastrointestinal series, or barium enema, offers more diagnostic aid than any other laboratory procedure. Casley (8) points out that these cysts appear as shadows of watery density displacing the intestines and stomach. Ladd and Gross (4) suggest that if roentgenological studies show that the mass lies in front of the intestines, it is more likely to be an omental cyst than a mesenteric tumor.

The most satisfactory treatment of any mesenteric cyst is complete surgical extirpation by dissection from the mesentery. Frequently, because the tumor is widely adherent to an adjacent portion of the intestine, part of the intestine must be excised with the cyst. Marsupialization of the cyst should not be done when excision is feasible.

#### CASE REPORT

D. S., a 10-month-old white boy was admitted to the hospital 29 May 1948. The mother stated that the child was vomiting, restless, and had had fever for 3 days. In addition the child had had no bowel movement for 2 days.

Birth history and past medical history were irrelevant except for occasional attacks of vomiting of 2 to 3 days' duration and failure to gain weight normally.



of vascularity. The blood vessels in some areas were dilated and contained laked cells.

*Diagnosis*—Findings are compatible with a diagnosis of lymphatic cyst of the mesentery.

#### REFERENCES

1. MILLER, L. A. Rarity of congenital mesenteric cysts. *Am J Dis Child* 50: 1196-1202, Nov 1935.
2. WARFIELD, J. O., JR. Study of mesenteric cysts with report of two cases. *Ann Surg* 96: 329-339, Sept 1932.
3. FLYNN, C. W. *Ann Surg* 140: 505, 1930.
4. LADD, W. E. and GROSS, R. E. *Abdominal Surgery of Infancy and Childhood*. 3d edition. W. B. Saunders Co. Philadelphia Pa., 1947. pp. 233-240.
5. GUTHRIE, R. F. and WAKEFIELD, E. G. Mesenteric cysts. *Proc Staff Meet Mayo Clin* 18: 52-58, Feb 24, 1943.
6. PETERSON, E. W. Cysts of mesentery. *Ann Surg* 113: 80-86, July 1940.
7. MEIR, J. B. G. Mesenteric cyst causing attacks of subacute obstruction in child. *Lancet* 1: 742-744, March 30 1937.
8. CAFFEY, J. *Pediatric X-ray Diagnosis*. 2d edition. The Year Book Publishers, Chicago, Ill., 1946. p. 409.



#### ROENTGENOLOGIC OBSERVATIONS IN MESPENTERIC THROMBOSIS, by R. A. Rendich and L. A. Harrington. *American Journal of Roentgenology and Radium Therapy* 52: 317-322, Sept. 1944

Rendich and Harrington reported three cases of mesenteric thrombosis, in two of which they postulated a diagnosis of mesenteric thrombosis. In a patient with a clinical diagnosis of intestinal obstruction, a roentgenogram of the abdomen showed gaseous distention of the small intestines and the right half of the large intestine, suggesting mechanical obstruction in the splenic flexure. Surprisingly the barium enema passed the site of the obstruction to fill the entire colon. This patient died and necropsy showed thrombosis of the superior mesenteric artery with gangrene of the small intestines, cecum, and part of the ascending colon, the regions corresponding to the distribution of superior mesenteric vessels. Harrington reported 4 additional cases with similar roentgenographic signs in which the diagnosis of mesenteric thrombosis was confirmed either at operation or necropsy.

This simple roentgenologic procedure offers a means for differential diagnosis in an acute abdominal surgical emergency where only early and prompt diagnosis will avert an otherwise inevitable catastrophe.—*Abstract*



# Cavernous Hemangioma of the Left Lobe of the Liver

## Report of a Case

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ROBERT H. HOLMES, *Lieutenant Colonel, MC, U. S. A.*<sup>2</sup>

**S**MALL, asymptomatic cavernous hemangiomas are more common than is generally believed. Such small hemangiomas are a frequent incidental finding at autopsy. Large hemangiomas are less common, and rarely does such a lesion attain the size of the one noted in this report.

### CASE REPORT

The patient was a 46-year-old Negress who had lived for the past 23 years in Panama. On 22 January 1949 she delivered her thirteenth child in Colon Hospital. Following delivery she noticed a nontender mass the size of an orange, deep in the left upper quadrant of her abdomen. She was discharged from the hospital to return later for further investigation of the mass. She returned in May. In the 4 months' interval the mass had increased in size and occupied most of the upper abdomen. A barium enema and gastrointestinal series were normal except for the displacement caused by the tumor. Numerous consultants examined the patient and concluded only that she presented a rapidly enlarging mass, apparently of a cystic nature. An exploratory laparotomy was performed on 22 July. A mass involving the left lobe of the liver was found, with sharp demarcation between an apparently normal right lobe and the tremendous tumor involving the left lobe. A biopsy was reported as a cavernous hemangioma of the liver. After an uneventful recovery the patient was transferred to the Gorgas Hospital.

On 11 August the abdomen was again opened through a long right rectus incision. A few dense adhesions had developed between the vascular mass, abdominal wall, and adjacent jejunum. After the release of the adhesions, this unusual tumor was found to measure 42 by 28 by 22 cm. and contained an estimated 1,000 cc. of blood. The left lobe of the liver was indistinguishable from the mass, and it appeared that the tumor was the greatly enlarged left lobe of the liver. The tumor occupied the entire left side of the abdomen and its lower pole extended below the brim of the pelvis. The distinction in appearance between the normal right lobe and the left lobe of the liver was so clear as to form a semblance of a pedicle. The hepatoduodenal ligament was incised and a careful dissection of the hepatic artery was accomplished. The right hepatic artery was identified and traced to the right lobe of the liver, and

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a greatly enlarged left hepatic artery was traced to the tumor. The important adjacent structures were identified and found to be beyond the limit of the intended transection of the liver. Accordingly the left hepatic artery was doubly ligated and severed. Next, the left triangular ligament was severed, additional adhesions were released, and the left lobe was mobilized.

During this procedure the tumor was held out of the abdomen, and it was observed to decrease in size, to about half its original dimensions. It appears that with the left hepatic artery ligated the patient was, in effect, given an auto-transfusion from the tumor. The liver was quickly transected at the junction of the right and left lobes. Hemorrhage was controlled by digital compression. The larger intrahepatic vessels were individually ligated. Hemostasis was completed by inserting a series of interrupted mattress sutures of heavy silk. Convalescence was uneventful. The patient was discharged on the twentieth postoperative day. Frequent follow-up visits since that time indicate an apparent cure.

#### *Pathologist's Report*

*Gross findings*—The large, encapsulated, red brown mass measured 21 by 15 by 6 cm. and weighed 1,050 gm. The capsule was thin and transparent. One surface exhibited a suggestion of a pedicle measuring 3 by 4 by 1 cm. The mass was soft and spongy but fibrous on cutting revealing a bloody meaty parenchyma. Two large fibrous trabeculae traversed the mass and radiating therefrom were many smaller, interlacing septums (fig. 1).



Figure 1.—Cut surface of hemangioma of liver. Note wide, fibrous supporting trabeculae and monotonous bloody, spongy architecture.

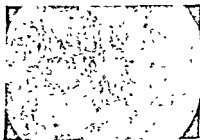


Figure 2.—Cavernous blood sinuses in juxtaposition with islands of liver cells and thickened anastomosing septums of blood sinuses.

*Microscopic findings*—Multiple sections showed anastomosing vascular channels of variable size lined by elongated flattened cells resembling endothelium. Most of the sinuses contained blood. Occasional islands of liver cells were observed within this mosaic. There was a monotony of pattern with little cellular pleomorphism (fig. 2).

*Diagnosis*—Cavernous hemangioma of liver.

#### DISCUSSION

In 1904 Albrecht (1) introduced the term "hamartoma" for certain vascular tumors of the liver which he considered to represent a malformation or developmental defect. This defect appeared to express itself as an abnormal combination of normal components of the organ, and could be one of arrangement, quantity, or degree of differentiation.

This concept and terminology has since been employed by many authors.

Multiple hamartomas have also been reported. Von Fallowski (2) described an infant exhibiting nodules of vascular tissue in the liver, the spleen, and multiple angiomas of the skin. Turner (3) reported a case of arterovenous hamartoma of the brain. Moolten (4) pointed out that neurofibromatosis was possibly an instance of disseminated hamartoma. The existence of combined hemangioma of the cerebellum and retina is well established. Recently one of us saw two cases of congenital familial telangiectasia with multiple vascular lesions of the skin, mucous membranes, and a large pulmonary arteriovenous fistula. In one of the lungs four additional small hemangiomas were discovered. McDonald, Harrington, and Clagett (5) reported 23 cases of pulmonary hamartoma. Numerous cases of hemangioma involving bone are recorded. Congenital polycystic disease of the liver, kidneys, and pancreas is also quite familiar. Tuberous sclerosis is also incriminated in this galaxy of developmental tumors.

The relationship of the frequent cutaneous hemangiomas, apparently unrelated to visceral involvement, to the concept of Albrecht's hamartoma needs clarification. These vascular tumors wherever found are usually benign although instances of malignancy have occurred. Kaposi's metastasizing angiosarcoma if related to the hamartoma must represent a malignant mesenchymal variant. Stout (6) rejected many cases of supposed malignant vascular tumors. Most vascular tumors cannot be differentiated from hamartomas, or vascular malformations, the apparent tumor being caused by non-neoplastic enlargement of preexisting vascular tissue (7). Jaffe (8), Taylor and Moore (9), and De Navasquez (10) suggest that metastasis in certain cases is only apparent, being actually of multicentric origin. True malignant tumors of vascular origin are extreme rarities (11). Hastings-James (12) reported a fatal case of hemangioblastoma of the liver. The present case is concerned with a huge apparently benign hemangioma of the liver that was successfully removed. The history is somewhat alarming in that the mass grew to the size exhibited in about 6 months. The presence of an intact capsule and an accessible pedicle facilitated complete removal.

Gruenwald (13) pointed out that the age at which a disturbance takes place has often been considered as a criterion for malformation and birth has been set as the borderline, but he could not subscribe to this assumption since identical malformations may develop before and after birth. A disturbance of embryonic growth indicates a structural mutation with the factor of differentiation and rate of growth altered but not uncontrolled and the quality of function partially maintained. A disturbance of growth, such as cancer, in

postnatal or adult life, on the other hand, usually implies an anatomic, functional, possibly genetic mutation with the quality of differentiation regressive or lost, and proliferation uncontrolled. It is suggested that the hamartomas embrace features of both extremes. A hamartoma, therefore, is a developmental defect manifested by an overgrowth of tissue yet responsive to organized influences, exhibiting the quality of specific structural and functional differentiation as well as controlled rate of growth and benign natural history. The present case represents these features and as such can be considered a hemangio-hamartoma. The mechanism of formation can be explained as a disturbance of a mesenchymal vascular anlage, of unknown etiologic basis, but possibly hereditary (14).

#### REFERENCES

1. ALBRECHT. Ueber Hamartome. Verhandl. d. deutsch. path. Gesellsch., Jena 7: 153-157, 1904.
2. VON FALKOWSKI, A. Über eigenartige mesenchymale Hamartome in Leber und Milz neben multiplen eruptiven Angiomen der Haut bei einem Säugling. Beitr. zur path. anat. und zur allg. path. 57: 385-414, 1914.
3. TURNER, O. A. Arteriovenous hamartoma of brain, report of case with autopsy. Arch. Path. 24: 223-229, Aug. 1937.
4. MOULTON, S. E. Hamartial nature of tuberous sclerosis complex and its bearing on tumor problem: report of case with tumor anomaly of kidney and adenoma sebaceum. Arch. Int. Med. 69: 580-623, April 1942.
5. McDONALD, J. R., HARRINGTON, S. W., and CLAGETT, O. T. Hamartoma (often called chondroma) of lung. J. Thoracic Surg. 14: 125-143, April 1947.
6. STOUT, A. P. Hemangio-endothelioma, tumor of blood vessels featuring vascular endothelial cells. Ann. Surg. 115: 447-464, Sept. 1943.
7. WILLIS, R. A. The Spread of Tumours in the Human Body. Churchill, London, 1933. p. 151.
8. JAFFE, R. H. Multiple hemangiomas of skin and of internal organs. Arch. Path. 7: 44-54, Jan. 1929.
9. TAYLOR, A. C., and MOORE, E. Multiple hemangiomas showing certain malignant characteristics in infant, report of case. Am. J. Cancer 19: 31-39, Sept. 1933.
10. DE NAVASQUEZ, S. Angioblastoma of spleen with metastases in liver. J. Path. & Bact. 42: 651-656, May 1936.
11. WILLIS, R. A. Pathology of Tumors. London, 1948. p. 717.
12. HASTINGS-JAMES, R. Malignant haemangio-endothelioma (haemangio-blastoma) of the liver. J. Path. & Bact. 61: 49-53, Jan. 1949.
13. GREENWALD, P. Mechanisms of abnormal development: postnatal developmental abnormalities. Arch. Path. 41: 648-664, Dec. 1947.
14. PINES, B., and RABINOWITZ, J. Hemangioma of spleen. Arch. Path. 33: 487-503, April 1942.



# Benign Esophageal Stricture and Carcinoma of the Esophagus<sup>1</sup>

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UNTIL 1941 only 31 cases of carcinoma of the esophagus arising at the site of chronic strictures of that organ had been recorded. In that year, Benedict (1) critically analyzed these cases and added 2 of his own. A review of this group reveals that 17 of the strictures followed lye burns, 2 resulted from foreign bodies, and 1 was congenital. The remaining 13 were "unknown" or of unreported causation. In the case to be presented, no background factor of known significance could be elicited. Of special interest is the youth of the patient.

## CASE REPORT

A 38-year-old white veteran was admitted to the Halloran Veterans' Administration Hospital on 13 May 1948 with a history of acute esophageal obstruction of 3 weeks' duration. Dilatation at another hospital had been only partially successful and obstruction had recurred.

*Past history*—At age 12, he had an episode of sudden esophageal obstruction requiring gastrostomy and repeated bouginage. After 1 month, dilatation was effected to the point where the gastrostomy was permitted to close.

The following years were uneventful until 1944 when he entered a station hospital in France for "battle fatigue." At that time he complained of some difficulty in swallowing large bolus of food. Roentgenogram showed a stricture of the upper one-fourth of the esophagus. In 1945 he was honorably discharged from service and continued his occupation (bakery wagon driver) until the present illness.

With the exception of evidence of recent weight loss (24 pounds) the physical examination was negative. Laboratory examinations were as follows: Hb., 14 gm. per 100 cc., 5 million red blood cells per cu. mm., 8,000 white blood cells per cu. mm., and a normal differential. The stools were repeatedly negative for occult blood. The urinalysis was negative, the blood proteins, 6.5 gm. per 100 cc. with a normal A/G partition. The esophagram showed at the junction of the proximal and middle thirds of the esophagus, practically obstructing the lumen, an irregular ragged defect, 4 cm. in length, and several dentate projections, sug-

<sup>1</sup> Sponsored by the Veterans' Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are a result of his own study and do not necessarily reflect the opinion or policy of the Veterans' Administration.

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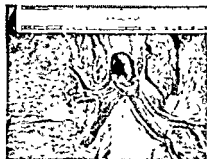


Figure 1.—Gastrotracheal fistula at necropsy

gesting sinuses arising from the left lateral wall of the lesion. Esophagoscopic examination showed a fungating tumor, 19½ cm from the upper incisors and biopsy showed the growth to be a squamous cell carcinoma. Bronchoscopic examination was negative.

Under endotracheal ether-oxygen anesthesia, a subtotal esophagectomy with intracervical gastro-esophageal anastomosis by the Sweet technique (2) was performed by the consultant in chest surgery.<sup>2</sup> No local metastases were detected and the 7½ hour operation

was completed without untoward incident. The carcinoma, which measured 3 cm in length, almost completely obstructed the lumen and penetrated to the outermost layers of the esophageal wall.

On the fifth postoperative day the patient was up and around and eating a soft diet. With the exception of transient discomfort substernally when he overate, he had no complaints and during the following 3 months he did remarkably well. There was a weight gain of 15 pounds but a persistent irritative cough appeared which became aggravated on swallowing food. Bronchoscopic examination in August 1948 showed an extension of the carcinoma into the trachea just above the tracheal carina. High voltage roentgen therapy was given without beneficial results. Jejunostomy was performed but the course was progressively downhill and the patient died 2 months after the latter procedure.

At necropsy a 3.5 by 2.5 cm perforation of the stomach into the trachea, approximately 4 cm below the level of anastomosis (fig 1), and metastases were present in the paratracheal region as well as in the right posterior chest wall and right visceral pleura.

#### REFERENCES

1. BENEDICT, D. D. Carcinoma of esophagus developing in a benign stricture. *New England J Med* 224: 408, March 6, 1941.
2. SWEET, R. H. Carcinoma of mid thoracic esophagus, treatment by radical resection and high intrathoracic esophigogastric anastomosis. *Ann Surg* 124: 653, Oct 1946.

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# Sound Problems in the Air Force

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THE operations incident to the manufacture, test and flight of aircraft have always been noisy. The noise problem became so acute during World War II, particularly because of the adverse effects of noise on speech communication, that a great deal of effort was expended by both governmental and private laboratories in: (a) devising methods for suppressing noise generation (1) (b) designing sound-absorbing and sound-excluding treatments for the interior of aircraft (1) (2) (3); and (c) designing and constructing noise-excluding devices to be worn by personnel exposed to noise (4) (5).

Baranek (6) (7) discusses the effect of noise on comfort and safety in residential structures and has suggested possible solutions to these problems. Knudsen (8) in a more general discussion of noise as a hazard to safety, efficiency, and comfort has presented data on typical noise levels in streets, transportation facilities, work areas, and residential areas. He proposes the following as standard "Acceptable Noise Levels."

In hospitals.....	35 to 40 decibels.
In private offices.....	40 to 45 decibels.
In factories.....	45 to 80 decibels

The operation of conventional aircraft, both on the ground and in flight, is accompanied by sound levels in excess of the proposed "acceptable" maximum for factories (9). With the development of the jet power plant the noise levels have been greatly increased.

Various complaints, attributed to high frequency sound, have been and are being received from men who test and service jet engines and from pilots of jet propelled aircraft. From men working with jet engines on the ground, these complaints have included deafness; tinnitus; vibration of the head, teeth, abdomen, and chest; nausea; vomiting; unusual fatigue; and increased irritability both on the

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job and after hours. Pilots' complaints included acute fatigue, inability to concentrate, headaches, loss of flying "feel," numbness and detachment while flying, and sensations of faintness. This article deals with some of the known relationships of air-borne sound to the problems of supersonic speeds and sound of ultrasonic frequency.

Sound in the ultrasonic frequency range means sound at frequencies above the audible frequency range. The American Standards Association (10) has tentatively adopted the arbitrary range of 15 to 15,000 cycles per second (double vibrations per second) as the frequency limits of audible sound. While this seems to be a good generalization, many children and young adults with "perfect" ears can hear sound frequencies as high as 20,000 cycles per second and when the tones are loud enough some people can hear frequencies at least as high as 25,000 cycles per second (11) (12) (13). To what extent do such high frequency sounds exist? Every time one vocalizes a loud "peest" many measurable ultrasonic frequencies are produced. Compressed air escaping from a jet on the laboratory bench is an excellent source of ultrasonic frequencies.

Since the war microphones capable of measuring this high frequency sound have been developed and many such measurements made (14) Figure 1 shows the results of measurements made near a jet engine. Here sound pressure is plotted as a function of frequency. Immediately it is apparent that ultrasonic frequencies are present

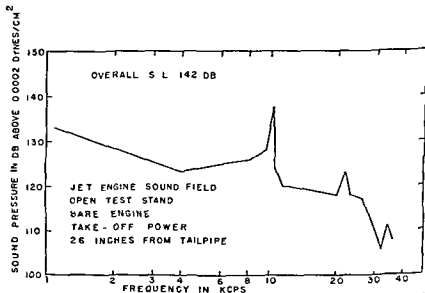


Figure 1—Sound pressure as a function of frequency for a sound field produced by a turbo-jet engine (high frequency analysis, 400 cycles per second half-band width).

and that they are low in intensity compared to the audible sound frequencies present. To the best of our knowledge these are the highest sound levels in the ultrasonic frequency range that have been recorded either around jet engines or in jet aircraft. Sound in the audible frequency range at levels up to 120 decibels above the standard reference does not appear to be injurious to man except for effects on or through the hearing organ.

Does sound pitched too high for the human ear to hear in some mysterious way penetrate the body and cause damage of some sort at rather low intensities? As far as air-borne sound is concerned, such is not the case. These frequencies are almost totally reflected by the skin. Measurements of the sound reflection and absorption coefficients at various frequencies have been made for white rats and for man (15). For the white rat about 5 percent of the sound energy is absorbed at 400 cycles per second. This absorption drops to about 2.5 percent at 1,200 cycles per second and then rises to about 12 percent at 6,000 cycles per second. If the rat's fur is shaved off, the sound absorption again is 5 to 7 percent of the total sound energy present for a frequency of 400 cycles per second and this absorption decreases rapidly with increasing frequency until it is only 0.5 percent at 3,600 cycles per second. The absorption coefficient of rat fur alone has been shown to be about 1.5 percent at 400 cycles per second and increases with increasing frequency to about 7.5 percent at 3,600 cycles per second. Above 1,200 cycles per second the absorption coefficient for the fur alone is identical with that for the intact animal. We have no reason to believe that the absorption decreases again until much higher frequencies are reached.

When such furred animals as mice (16), rats, and guinea pigs (17), are placed in sound fields of the order of 155 decibels above the standard reference level the fur and body temperatures rise to lethal levels in very short times. Exposure of rats to radiant heat under appropriate conditions has caused death in approximately the same time, has brought about an essentially identical behavior during exposure, and has produced essentially identical pathologic changes. One must conclude that the absorption of acoustic energy from the sound field with conversion to heat and elevation of the body temperature is the primary cause of death.

At this point it might be well to point out that the decibel scale is logarithmic and that sound energy in a sound field that contains no standing waves or reflections increases as a square of the sound pressure. Thus an increase of 20 decibels means a tenfold increase in sound pressure and a hundredfold increase in sound energy. Or for another example, at 126 decibels the sound pressure is approximately twice and the sound energy four times their respective values at 120 decibels.

If we were to expose one of these animals to a sound field just three decibels less intense than one which would just kill him, he will be exposed to and absorb only one-half the lethal quantity of sound energy and should be able to reach a stable equilibrium with his environment. Experimentally this has proved to be true (18). The animal's temperature rises to 37° to 38° C. and becomes stable at that point. Following exposure to such a sound field for an hour or more the animal appears to be deaf but continues in good health in all other respects indefinitely. Thus it is clear that even the rat with his highly absorbent fur coat can survive quite well in sound fields of the order of 150 decibels above the standard reference.

Now man is not a rat and he does not normally wear a fur coat. The sound absorption coefficients for man vary with frequency as they do for a shaved rat except that they are even lower (15). At a frequency of 400 cycles per second man's skin absorbs about 4.8 of the total sound energy. The absorption coefficient decreases rapidly with increasing frequency until it is less than 0.5 percent at 6,000 cycles per second and even less at 18,000 cycles per second. The difficulties of measuring such small absorption coefficients are such that it is impossible to give exact figures. At the present time there is no reason to believe that this absorption coefficient rises at even higher frequencies. Men exposed to ultrasonic frequencies produced by a siren in the laboratory at levels 40 decibels higher (100 times the sound pressure and 10,000 times the sound energy) than have been found around jet engines have noticed no ill effects. It thus becomes highly improbable that air-borne sound in the ultrasonic frequency range, even at higher intensities than we have found to exist anywhere but in the laboratory, will be harmful to man.

This would seem to contradict much of the work and many of the statements appearing in the literature on the subject of ultrasonics. For many years small crystal ultrasonic generators have been used to disrupt bacteria and micro-organisms, to accelerate chemical reactions, and to produce destructive lesions in laboratory animals (19) (20) (21) (22) (23). Hovvath (24) (25) (26) in Germany and Herrick (27) in this country at the Mayo Foundation have been investigating the use of such ultrasonic generators in the treatment of cancer. In all of this work contact between the crystal generator and the exposed material was made through an oil or water medium from which air had been carefully excluded. Under these conditions surface reflection phenomena are minimal and nearly all of the sound energy generated by the crystal is absorbed in the exposed biological material thereby heating or otherwise disrupting the structure. The conditions for ultrasound in air are quite different. Sound energy at high frequencies in air is almost completely reflected by any liquid or

solid surface. Much of the confusion concerning ultrasound as an Air Force hazard arises from the mistaken inference that the results obtained with fluid-coupled generators are valid for an *in-borne* sound. They are not.

The bulk of the aeromedical sound problem is thus confined to the audible sound frequencies. Figures 1 and 2 show that sound levels in excess of 130 decibels may be expected from a few hundred cycles per second up to 10 or 12 thousand cycles per second. At some frequencies the level may be as high as 140 decibels with this particular engine, and with more powerful engines we have found the sound level to be as high as 150 to 160 decibels.

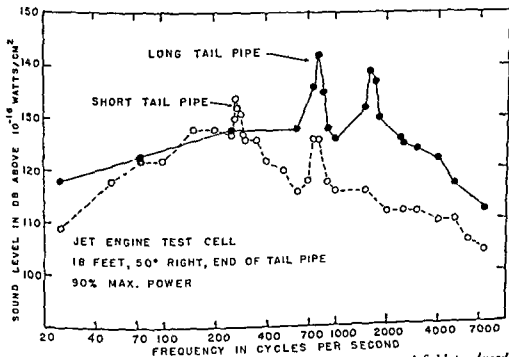


Figure 2.—Sound pressure as a function of frequency for a sound field produced by a turbo-jet engine (low frequency analysis, constant percentage band width, down 3 decibels at 1 percent of tuned frequency).

Obviously the ear is of first importance when considering sound in the audible frequency range. At about 120 decibels most persons feel a tickling or uncomfortable sensation in the ear. The threshold for pain in the ear varies with individuals, but most will feel pain by the time sound levels have reached 140 decibels (28). Judging from a single case where rupture of the drum occurred in a known sound field, one can expect rupture of the drum to occur at a sound level of about 160 decibels (29).

Davis et al. (30) have shown that significant temporary hearing losses will occur after exposure to pure tones or to band spectrum noise for 4 to 8 minutes at levels of 120 decibels above the standard reference. By temporary deafness we mean a deafness that follows

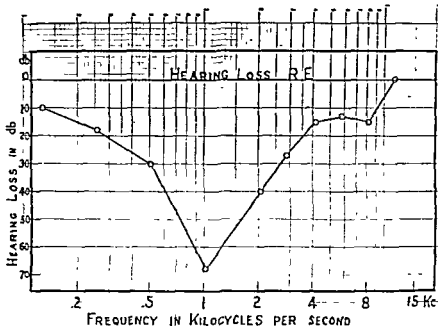


Figure 3—Hearing threshold loss as a function of frequency following a 10-minute exposure without ear defenders to jet engine noise at 146 decibels above the standard reference level.

overstimulation, is not permanent, and is apparently due to fatigue of the end organ. Longer exposures at intensities of 110 decibels or shorter exposures at intensities higher than 120 decibels will give similar hearing losses. Since a jet engine will produce sound pressures at least as high as 130 decibels throughout the speech frequency range (300 to 4,000 cycles per second) it seems obvious that the unprotected ear will suffer from exposure to such noise. Figure 3 shows the hearing loss that existed 12 minutes after an ear had been exposed for 10 minutes, without ear defenders, to a 146-decibel over-all sound level near the exhaust of the jet engine whose sound field is presented in figure 1. The hearing loss is in excess of 30 decibels throughout the frequency range 500 to 2,000 cycles per second. This is the most significant frequency band for the perception and understanding of speech.

During the last war considerable effort was directed toward providing means of protecting the ears of men who fired guns, operated tanks, flew in aircraft, worked in factories, and tested engines. In most cases, where continuous noise was encountered, the sound level was less than 125 decibels. The result of this effort (4) (5) was the V-51R ear defender, a small insert-type ear plug made of either vinylite or neoprene. When various factors such as size, weight, comfort, chemical and physical irritation of the external canal, available

materials, et cetera, are considered, it seems that the V-51R excludes sound from the ear about as well as an insert-type defender can do. Under optimal conditions of fit the V-51R provides.

- 26 decibels sound attenuation at 100 and 250 cycles per second
- 29 decibels sound attenuation at 500 cycles per second
- 31 decibels sound attenuation at 750, 1,000, and 1,500 cycles per second
- 35 decibels sound attenuation at 2,000 cycles per second.
- 36 decibels sound attenuation at 2,500 to 8,000 cycles per second

For sound levels up to 125 decibels it can be seen that the V-51R is reasonably adequate protection, reducing the sound level at the ear to less than 100 decibels. Using this same sound attenuation data, it can be calculated that at a frequency of 1,000 cycles per second and an intensity of 140 decibels the sound level at the ear would be reduced only to 110 decibels. Davis et al. (30) have shown that sizable temporary hearing losses may be produced by a 1,000-cycle per second tone at 110 decibels.

The hearing loss shown in figure 4 resulted from an incidental exposure to a "synthetic" sound field and demonstrates these limitations of the V-51R. The sound field was generated by a laboratory siren inside an anechoic room. Standard V-51R ear defenders, carefully fitted to the subject's ears were worn throughout the exposure. The

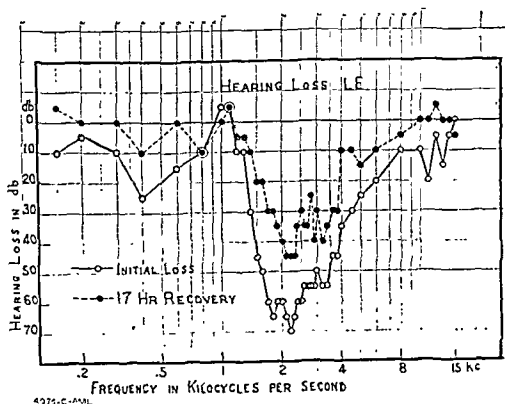


Figure 4.—Hearing threshold loss as a function of frequency following exposure to siren sound field.

in the noise field. After 3 days considerable recovery occurred but at the end of 30 days there was very little more recovery of auditory sensitivity and the hearing threshold was still appreciably depressed. This hearing loss may be permanent. In addition many cases were found where the total hearing loss increased steadily as shown by audiograms taken over a 6- or 12-month period. It appears probable that those persons who exhibit progressive hearing loss with increasing time of exposure to noise will be permanently deaf as a result of the repeated "acoustic trauma."

In addition to the temporary deafness and possible permanent deafness previously discussed, the ear is subject to masking of desired speech or code signals by undesired noise. Any sound is said to produce masking when it raises the threshold of audibility of a second sound (33).

The effectiveness of a sound as a masking noise depends about equally on its frequency components and its intensity (34). Of course, if the desired signal is as loud or louder than the noise, it can be heard. Also if the masking noise is louder than the desired signal but contains only frequencies much lower or higher than the desired signal, the signal will be heard. Although one can talk and be understood through the noise of hammering or the 75 to 150 cycle per second noise produced by a reciprocating engine with a propellor, it is much more difficult to do this in the presence of noise produced by rubbing two pieces of sandpaper together or in the presence of the hiss of aerodynamic noise.

It is usually accepted by pilots that the B-25 is a very noisy airplane and that the F-80 is a very quiet one. It is true that in the frequency bands from 20 to 300 cycles per second which contain the engine and propellor noise, the sound levels of 110 to 115 decibels inside a sound-treated B-25 (11) are 6 to 13 decibels higher than they are in an F-80. However, in the frequency bands from 300 to 4,800 cycles per second the sound levels in the F-80 (35) of 112 to 114 decibels are 9 to 22 decibels higher than they are in the B-25. While the lack of very low frequency sound and vibration in a jet aircraft and the noise excluding properties of helmets give the pilot and crew the impression it is a quiet airplane, direct speech communication is nearly impossible due to the high level masking noise in the speech frequency spectrum. It is indeed fortunate that helmets and headsets with doughnut type seals are much better for excluding noise in this frequency range than they are for excluding propellor noise.

It has been pointed out that while sound frequencies above 6,000 cycles per second are very poorly absorbed by human skin, 4 to 8 percent of the sound energy may be absorbed at lower frequencies. For frequencies below 2,000 cycles per second, intense sound of the

order of 150 decibels becomes a problem for parts of the body other than the ear. Using a laboratory siren generating sound levels between 150 and 170 decibels some interesting phenomena have been observed in man at these low frequencies (17). At frequencies from about 1,500 cycles per second down to about 700 cycles per second there is a sensation of marked vibration of the cranial bones. At certain of these frequencies the sensation of vibration from the jaw is so strong that one reflexly grits his teeth in an effort to stop the vibration.

There is also a sensation of vibration combined with air movement in the nasal passages and bony sinus. A similar sensation is noted in the mouth and pharynx, especially when the mouth is open. At certain frequencies, which have not been precisely determined, in the range 700 to 1,500 cycles per second, the vision may become blurred when one stands in the sound field. Recovery is immediate and complete as soon as one steps out of the sound field. As the frequency of the sound field to which one is exposed is still further decreased, the sensations of vibration are felt in the thorax, abdomen, and in single muscles or muscle groups of the arms and legs.

The sensations of vibration that have been observed in the laboratory at known frequencies and intensities of the sound field are identical with sensations observed when standing near the tail pipe of a jet engine on an outside test stand. Where standing wave patterns may be produced in enclosed test cells these phenomena are more distinct.

There have been occasions both in the laboratory and at jet engine test stands when personnel have observed a "weakness" in the knees or an apparent general weakening of the body supporting musculature. This sensation is usually not accompanied by faintness or vertigo. It would appear to result from some effect on the proprioceptive reflex mechanism, since, with conscious effort, one can maintain his posture and move about. At higher sound levels in this frequency range a few subjects have experienced vertigo in addition to the weakness described. During short exposures none of these vibratory sensations are accompanied by pain or after effects so that it is doubtful that gross physical damage occurs. Yet even experienced observers feel considerable discomfort and apprehension in these sound fields. Such loud low frequency sounds instinctively mean danger to a man. After exposures of 30 minutes or so fatigue, irritability, and a feeling of being slightly drugged have been observed. So far the modes of action and physiologic changes which accompany these reactions have not been adequately studied. Due to the bulkiness and weight of materials that would be required to insulate a man from such sound and vibrations, structural sound



insulation rather than personal equipment seems to be the practical approach for any protective measures necessary.

In the case of engine test facilities much progress has been made along this line. However, experience has shown that even well-designed and well-insulated control rooms and work areas fail to exclude sound when workmen fail to close windows and doors or fail to seal up the space around fuel and control lines running between control rooms and the engine test bed.

In conclusion it can be stated that sound above the audible frequency range is not currently a serious hazard. The knowledge of the existence of such sounds and in some cases the presence of annoying sounds in the upper audible frequency range may be psychologically disturbing to some persons. However, three major sound problems do exist. The first is the problem of deafness, both temporary and permanent. By the use of both insert-type and external ear defenders adequate protection may be expected in any sound field that is not so intense or so low in frequency as to be disturbing to the body as a whole. The second problem is the one of masking of speech in communication systems. Sound insulation for these frequencies is not too difficult and appropriate headphone and microphone design can be expected to provide satisfactory solutions. The third problem is the intense low frequency sound which is felt by the body as a whole. To date the only solutions seem to be spatial isolation and/or structural isolation in the form of engine mufflers and sound-proofed buildings.

#### REFERENCES

1. BARANEK, L. L., et al. Principles of sound control in airplanes. OSRD Report No 1543, 1944
2. WALLACE, DIENEL, and BARANEK, L. L. J Acoust Soc Am 18: 246, 1946.
3. NICHOLS; SLUTTER; WALLACE and ERICSON. J Acoust Soc Am 19: 428, 1947
4. WATSON, N. A. and KNUDSEN, V. O. Ear defenders. J Acoust. Soc. Am 15: 153-159, 1944
5. SHAW, W. A., et al. Development of ear wardens, type V-51R. OSRD Report No 5122, July 1947
6. BARANEK, L. L.: Design for acoustics. Physics Today 2: 18-22, 1949
7. BARANEK, L. L. Acoustics in comfort and safety. J Acoust Soc. Am. 21: 302-304, 1949.
8. KNUDSEN, V. O.: Acoustics in comfort and safety. J Acoust Soc. Am 21: 296-301, 1949.
9. RUDMOSE; BARANEK; WALLACE and ERICSON. Sound level measurements in United States military airplanes. OSRD Report No 624, May 1942
10. Proposed American Standard Acoustical Terminology. American Standards Association, February 1949
11. RUDNICK, I.: Personal communication.
12. GAYEAU, V.: Comptes Rendus des Seances de L'Academie des Sciences 226: 2073-2074, 1948
13. ELDEEDGE, D. H., and PARRACK, H. O.: Unpublished data.

14. ELDRIDGE, D. H., and PARRACK, H. O.: Jet engine sound spectra. USAF Technical Report No. 5827, United States Air Force, Air Material Command, June 1949.
15. VON GIERKE, H. E.: *J. Acoust. Soc. Am.* 21: 55, 1949.
16. AILYN, G. H.; FRINGS, H.; and RUDNICK, I.: *J. Acoust. Soc. Am.* 20: 62-65, 1948.
17. PARRACK, H. O.; ELDRIDGE, D. H.; and KOSTER, H. F.: Physiological effects of intense sound. U. S. Air Force Air Materiel Command Memorandum Report No. MCREND-695-71B.
18. ELDRIDGE, D. H., and PARRACK, H. O.: *J. Acoust. Soc. Am.* 21: 55, 1949.
19. DOGNON, A.; BIANCANI, L., and BIANCANI, H.: *Ultra-sons et Biologie*, Gauthier-Villars, Paris, 1937.
20. HARVEY, F. N.: Biological aspects of ultrasonic waves, general survey. *Biological Bulletin*, 59: 300-325, 1930.
21. LYNN, J. G.; ZWEMER, R. L.; and CHICK, A. J.: Biological application of focused ultrasonic waves. *Science* 96: 119-120, 1942.
22. LYNN, J. G.; ZWEMER, R. L.; CHICK, A. J.; and MILLER, A. E.: New method for generation and use of focused ultrasound in experimental biology. *J. Gen. Physiol.* 26: 179-193, 1942.
23. LYNN, J. G., and PUTNAM, T. J.: Histology of cerebral lesions produced by focused ultrasound. *Am. J. Path.* 20: 637-649, 1944.
24. HORVATH, J.: *Ultraschallwirkung Beim Menschlichen Sarkom*. *Strahlentherapie* 75: 119, 1944.
25. HORVATH, J.: *Ueber Die Wirkung der Ultraschallwellen Auf Des Menschliche Karzinom*. *Klinik u. Praxis* 1: 1946.
26. HORVATH, J.: *Weitere Erfahrungen Ueber Die Wirkung Der Ultraschallwellen Auf Des Menschlichen Sarkom*. *Klinik u. Praxis* 1: 108, 1946.
27. HERRICK, J. F.: Some biological aspects of ultrasonics. *Arch. Phys. Med.* 30: 145-149, 1949.
28. SILVERMAN, S. R.: Tolerance for pure tones and speech in normal and defective hearing. *Ann. Otol. Rhin. & Laryng.* 56: 658, 1947.
29. DAVIS, H.; PARRACK, H. O.; and ELDRIDGE, D. H.: *Ann. Otol. Rhin. & Laryng.* 58: 732, 1949.
30. DAVIS, H., et al.: Final report on temporary deafness following exposure to loud tones and noise. Committee on Medical Research of the OSRD, September 30, 1943.
31. SHAW, W. A., et al.: Measurements of insulation and sensitivity of service headsets. OSRD Report No. 6113, 1945.
32. MACLAREN, W. R., and CHANEY, A. L.: Evaluation of some factors in development of occupational deafness. *Indust. Med.* 16: 109-114, 1947.
33. STEVENS, S. S., and DAVIS, H.: *Hearing, Its Psychology and Physiology*. John Wiley and Sons, Inc. New York, N. Y., 1938. pp. 208-217.
34. MILLER, G. A.: The masking of speech. *Psychological Bulletin* 44: 105-129, 1947.
35. ROGERS, O. R., and OLFSACK, W.: Audio frequency noise in an F-50 airplane. U. S. Air Force, Air Material Command, Memorandum Report No. MCRD-XA5-4551-8-4.



# Medical Plans for Civil Defense and Disaster Relief<sup>1</sup>

WILLIAM L. WILSON, Colonel, MC, U. S. A.

**I**N THIS brief presentation it is hoped that we may achieve orderly thinking and make concrete suggestions of use to local and State committees in planning the medical phase of civil defense and disaster relief. Without a great deal of forethought, prolonged training, and the development of systematic performances, drills, and tests of all participants, no community can prepare itself to provide those additional health services that will be essential for civilians subjected to disasters. When the average community prepares itself for disasters the effort of each citizen and every profession must be fitted into a coordinated system. Whoever guides each part of the whole must have a clear concept of the working of all other parts. There is no easy road to medical preparedness for disasters.

There are two opinions as to local disaster planning. One maintains that no local planning is justified until an authoritative central agency is established to prescribe a uniform pattern for each locality. Such a regimented approach, if implemented, would result in a speedy realization of the desired total readiness. Certain elements of local plans would depend on such a system if mutual support between communities were to be achieved with maximum economy and efficiency. Such a system is the only one likely to survive major war disasters. A second group, maintaining that every community should proceed immediately with its own preparations for meeting disasters, is more realistic. Such a plan would not interfere with any national scheme to be devised later. Each community can lay the necessary groundwork in interim plans and at the same time improve its own and others' readiness to meet many problems that may never require intercommunity participation. Above all, much time and effort can be saved because such planning will be required with or without a uniform national pattern.

Several States and communities have already set up their own flexible schemes, readily adaptable to mutual support or national partici-

<sup>1</sup> Condensed from an address presented at Joint Meeting of Third Army Area Medical Department Reserve Officers and Fulton County Medical Society, Ga. 20 October 1949. Full text available on request to the Surgeon General, Department of the Army, Washington 25 D. C.

pation. None of them should find undue difficulty in adjusting to a future national pattern. No community should go so far in its plans as to provide greater reserve stocks of litters, ambulances, and medical supplies than could be readily used. On the other hand, no community can justify prolonged ignorance of its immediately available resources or neglect the writing of simple, feasible plans and instructions that may be implemented with a reasonable prospect of success. Even if an ideal national plan were produced overnight, it would not permit formation of unchanging national or local plans. Since in the development of any local, State, and national plans it is inevitable that changes will be necessary from time to time, delays to prevent later changes of local plans to meet national schemes will never be justified. This discussion deals with interim plans, that may be reasonable pending the advent of a national plan.

Certain essential activities in an interim disaster medical plan, if not previously considered, should be undertaken without further delay and generally in the following order: (a) Fixing responsibilities for all necessary activities;<sup>2</sup> (b) establishing necessary authority for meeting these responsibilities;<sup>2</sup> (c) classifying responsibilities and authorities as already adequately covered or not; (d) providing means for developing services not adequately covered;<sup>2</sup> (e) keeping a record of functions to be performed; and (f) developing a system of reporting every person treated.

As indicated above, legislation may be needed to fix responsibility, insure proper authority, and provide the means for additional civilian health activities required for disaster relief or civil defense. In civil defense this should be limited to organized civilian activities (a) to minimize the effects of any enemy action directed against the United States or other area which is a responsibility of the United States, and (b) to maintain or restore those facilities and services that are essential to civilian life, and are affected by such enemy action. A disaster will be considered to be a situation in which numbers of persons are plunged into helplessness and suffering and as a result may be in need of food, clothing, shelter, medical care, and other necessities of life. In disaster relief planning, therefore, the following premises should prevail:

1. Civilians should control and implement all civilian health services.<sup>3</sup>

<sup>2</sup> May require legislative action.

<sup>3</sup> Under existing law, civil administration could call for temporary military aid to the civil authority. The Hopley Civil Defense plan recommended certain military responsibilities, including final reliance on the Army for support in the event civil efforts were overwhelmed or became exhausted. That must not occur, but if it should the civil administration must be reestablished as soon as possible. To do otherwise might result in diversion of military medical resources from primary missions. The measure of our efficiency would be the speed with which the civil administration could be reestablished.

2. All responsibility to a military or civilian community for functional results rests on a military commander or a civilian administrator, respectively.\*

3. Military participation may take one or more of several forms: (a) Following a disaster, if the civil administration continues to operate, the Army may provide supplemental assistance, usually in the form of medical supplies or food; (b) following a natural disaster in peace or war the Army may provide medical supplies, sanitary aid, and other supportive measures as requested by the Red Cross or the States, and always with legal sanction; (c) under conditions of martial law, civil laws are administered by a military commander; (d) under conditions of military government the commander, subject only to the laws of war and to the instructions of his own civil government, prescribes such measures regarding health as he deems necessary, depending on the recommendations of technical advisors.

4. The functional planning and administration of your programs must be integrated by respective heads of civil and military administrations, to achieve which we must insure that (a) local military and civil administrators are thoroughly familiar with the scope and limitations of their functions; (b) those authorities comprehend the relationships that must exist between them, as well as with their respective superiors; (c) civil administration will be reestablished as soon as possible; and (d) civilians will function under civil control, with minimum military supervision or interference.

In developing community relief services not adequately covered here quantity and quality will depend on the location and type of disaster encountered. The community to furnish the relief services and the organizations responsible for specific functions must be clearly understood. An estimate of potential situations must have been made to permit provision of means (table 1). The categories and quantities of resources required must have been determined (table 2).

Since the limiting factor in any plan will be sufficiently trained personnel to perform the necessary functions, an inventory of available personnel is one of the earliest requirements (table 3). For this purpose personnel in public health services, in teaching institutions, and in any of the regular or reserve and civilian components of the Armed Forces must be considered unavailable. Specialists certified by the American specialty boards should be listed separately. With this information available, we may allocate geographically personnel to all public health, general medical, and specialist team functions.

\*This is proper, for health officers have authority derived through the military commander or the civilian administrator. On the other hand the health personnel must make certain that each administrator has made all necessary arrangements for the health services.

TABLE 1.—*Potential situations requiring interim medical plans for civil defense and disaster relief*

[Prepared by Col. William L. Wilson, M. C., U. S. Army, © September 1949]

Community or place of disaster or event	Community to furnish initial relief health services	Community requiring services	Source for additional health services when own are overextended	Community to furnish tents for services	Community in which services may need to be provided
Own only	Own	Own only	Own expanded Own improvised Another community Other expanded Other improvised Other + Own Own + Other expanded Own + Other improvised Own + All others	Own Own Own + Others Other Other Other + Own Other + Others Own + Other Own + Other Own + All others	Own Own Own + Others Other Other + Own Other + Others Own + Other Own + Other Own + All others
Other only	Other	Other only			
Own + Other	Own + Other	Own + Other			

Medical matériel resources should be listed according to whether they are used in public health or medical-care services. Few, if any, changes to normally effective public health services will be required except for quantitative expansion unless it is for additional functions to minimize casualties from atomic, biologic, psychologic, and chemical warfare. Table 4 indicates a method for inventory of immediately available hospital beds. In a similar manner the interim plan must include inventories of medical supplies (table 5) and medical transport (table 6) required for public health, therapeutic, and evacuation services.

The administration of a disaster relief plan requires detailed recording of functions to be performed. We have touched all too lightly on fixing responsibilities and providing authority, and essential means. These must be recorded and sufficiently disseminated to all concerned. Written notice of appointment should be sent to persons responsible for (a) preparation and maintenance of all plans; (b) procurement and assignment of personnel; (c) budgeting, procuring and disbursing funds; (d) establishing, publishing, supervising, and controlling policies, procedures, training programs, and training guides; (e) publishing operational systems and functions; and (f) activating, organizing, administering, and training functional units, such as first-aid personnel individually or in squads; litter-bearing squads; casualty-collecting teams; casualty clearing stations, ambulance drivers, attendants, shock treatment teams; blood and blood derivatives services, general surgical, orthopedic, maxillofacial, thoracic, neurosurgical, abdominal, and vascular surgical teams; burn treatment teams, chemical casualty treatment teams; radiologic casualty treatment teams; psychiatric and psychologic teams; infectious disease treatment teams, and epidemiologic teams. The exact components of these teams have not been prescribed. The organization of such teams in this interim period not only does not need to be uniform, but by their diversity and varied effectiveness will provide valuable experimental information tending to result in the most efficient types.

For interim planning the necessary medical equipment, supplies, transport and other material means should come from normal supply sources. Local efforts to standardize equipment within a community or between mutual-support communities should not be undertaken until national direction has been furnished. There must be written plans and instructions, based on the material inventories, for the procurement, storage, issue, replenishment, repair, and maintenance of (a) hospital plant facilities, (b) medical equipment and supplies, (c) patients' food and feeding, and (d) medical transport in the form of medical personnel-carrying vehicles, cargo vehicles, ambulances, and other patient-carrying vehicles.

TABLE 3.—Hospital beds immediately available in sample city for disaster relief

Quarter of city	Name of hospital		Address	Number of beds in hospitals with adequate space				Number of beds in improvised hospitals		Total
	Base (full surgery)	Secondary (clearing)		In regular daily use	Not in regular use but ready for emergency		Total with emergency beds	Normal use of space	Source of beds	
					In hospital	Elsewhere				
Northwest	City	Donks. Mercy	4th and Main 9th and Locust 1425 Grand	900 165 150	200 10	1100 175	1,200 175			
	St. Thomas	Charity Jackson Academy Tom's warehouse	Lee and Front 16 High St. High and Front Union square	900 175	50 20	975 200	975 200		School dormitory 150 University dormitory (3 miles), Dry storage 300	
				2,200	290	130	2,700	450		3,150
	Subtotal	2	5							
Northeast	Wesley		2215 Main	450			450			450
	Subtotal	1		450			450	0		
Southeast										
	Subtotal	0		0			0			0
Southwest	Maternity	University	Elm and Pearl	70	5		75	Dormitory 700	University	
	Subtotal	1		70	5		75	700		775
Total	4	6		2,810	295	130	3,225	1,150		4,375

1 City warehouse.

2 Nurses' home.

3 Staff quarters.





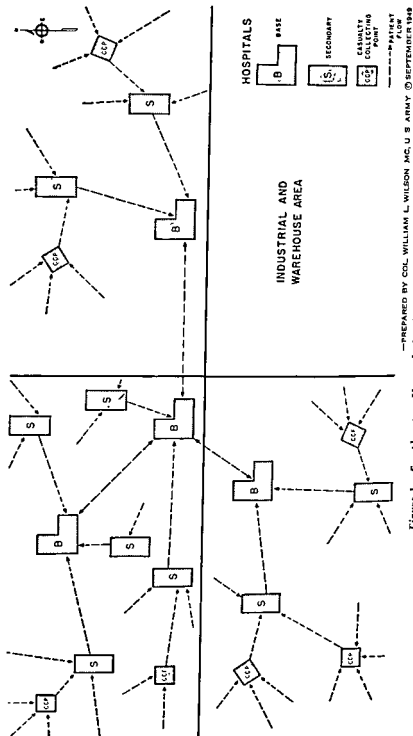
A scheme for hospitalization and evacuation of patients must be prepared, published, and understood by all concerned. Hospitals provide the basis for the whole system, so a hospital plan similar to that shown in figure 1 may be set up initially. After being tested by drills and experience, changes may be readily made to fit local conditions. As hospitals receive patients and approach capacity performance, provision must also be made for moving convalescent or well patients to other facilities or to their homes. A sample hospital evacuation scheme is illustrated in figure 2. The control of the flow of patients must be assured by establishing a medical regulating office for sections of the city, for the whole city, and for the State. The handling of patients from the application of first aid to their return to normal duties is shown in figure 3.

A records and reporting system referable to every person treated in civil defense or disaster relief must be developed and established in every instance in which the usual medical and health records and reporting will not fully meet requirements. The public must be brought to cooperate by wearing indestructible identification tags. Thus, a casualty, even though unable to talk or furnish self-help could be identified, his family notified, his property rights protected and later his insurance, compensation, or pension rights established. Each civilian medical unit must maintain a register of cases treated.

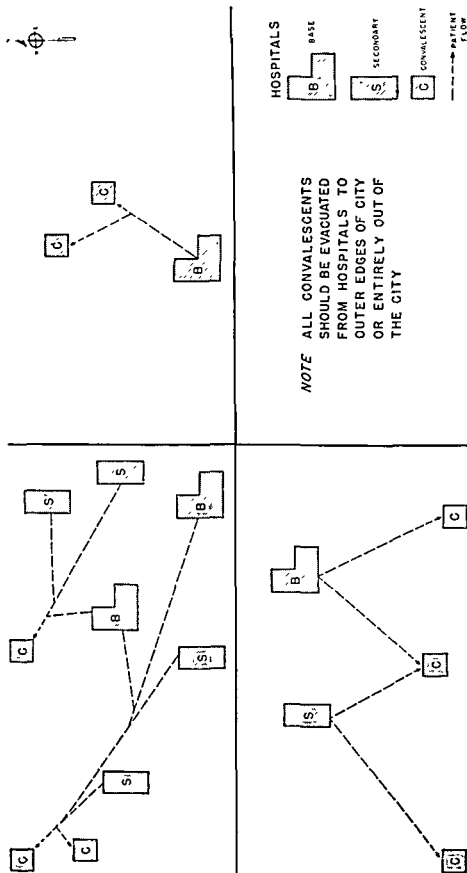
#### SUMMARY

Civil defense and disaster relief require the early assignment of responsibilities to persons throughout this scheme for: (a) directing, controlling, and supervising operations; and (b) coordination between their respective units and all others, particularly for mutual support.

Local civil defense and disaster relief plans must be integrated with military plans by means of (a) a simple classification of the entire adult population with regard to physical and temperamental fitness for essential duties in an emergency; (b) developing standards of the minimum of health services that would suffice, thereby insuring proper priorities in allocating personnel and matériel; (c) inventory of civilian medical resources, using terms that would make comparison between civilian and military resources easily understandable; (d) obtaining uniformity in classification of health personnel and in their organization into units of a type that would be equally adjustable to civil or military administration in wartime, could be transferred from one control to another with facility, and could be used with economy and efficiency by either; and (e) indexing our aggregate medical and health resources. The matter will be difficult, but can be achieved by cooperation and diligent study on the part of all concerned.



—PREPARED BY COL WILLIAM L. WILSON MC, U S ARMY © SEPTEMBER 1949  
 Figure 1.—Sample city. Hospital plan for disaster control.



—PREPARED BY COL WILLIAM L WILSON MC, U. S. ARMY, © SEPTEMBER 1949

Figure 2.—Sample city. Hospital evacuation of convalescent patients.

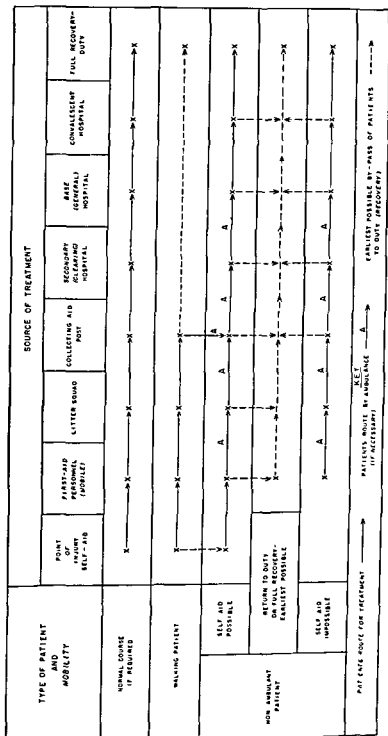


Figure 3—Medical plans for civil defense and disaster relief—interim evacuation scheme for casualties (diagrammatic).

—PREPARED BY COL WILLIAM L. WILSON MC U S ARMY © SEPTEMBER 1949

Although many communities would avoid planning for disasters which might never occur, because the vast efforts we have discussed would be deemed needless and wasted if a nation-wide program of civil defense and disaster control were set up and no disaster ever occurred, we should be happy rather than disappointed.



CHLORAMPHENICOL IN THE TREATMENT OF INFECTIOUS DISEASES, by  
Joseph E. Smadel, M. D. American Journal of Medicine 7:  
671-685, Nov. 1949.

Chloramphenicol is one of the important recent additions to the antibiotics of proved clinical value. It is effective against a wide variety of infectious agents, notably the rickettsiae of epidemic typhus, murine typhus, scrub typhus, Rocky Mountain spotted fever, rickettsialpox, and Q fever. Members of the psittacosis-lymphogranuloma venereum group of viruses, which are now classified as rickettsiae, were also considerably inhibited by this antibiotic. Since chloramphenicol is rickettsiostatic rather than rickettsiocidal, suppressive doses must be given long enough for the patient to develop immunity if he is to remain asymptomatic when the drug is discontinued. Chloramphenicol also has an inhibitory effect on the growth of a wide range of bacteria. The gram-negative bacteria predominate. While inhibition of growth of staphylococci and streptococci is obtained, the concentrations required to affect these organisms are far in excess of the effective concentrations of penicillin. High concentrations of the drug in certain culture media reduced the number of *Endamoeba histolytica*. Of greater significance, however, was the observation that large doses of the drug produced an appreciable clearing of infection in rats and dogs with experimental amebiasis.

Resistant variants can be developed from a number of species of bacteria that were originally susceptible to chloramphenicol. No drug-resistant strains of rickettsiae have yet been developed. Chloramphenicol is extremely stable. The drug levels in serum, urine, spinal fluid, milk, and bile can be determined by bio-assay. The chemical method for determining the drug may be used on serum and spinal fluid, but not on urine. Chloramphenicol is a specific therapeutic agent against typhoid fever. Although it is superior to the earlier forms of treatment for brucellosis, aureomycin appears to be equally efficacious. In the treatment of gonorrhea chloramphenicol compared favorably with other methods of therapy but cannot be relied on to suppress a concurrent syphilitic infection.—Abstract.



# Streptomycin in the Treatment of Tuberculous Lymphadenitis

JOHN A. C. GRAY, *Commander (MC) U. S. N.*<sup>1</sup>

IN THE large and growing literature on the treatment of tuberculosis with streptomycin, there are few references to the use of the drug in tuberculous lymphadenitis. This is probably due to the fact that scrofula is no longer a common disease. In the seventeenth century King Charles II is said to have administered the "king's touch" to 10,000 cases annually in London (1). Yet in a recent series of 3,998 admissions for tuberculosis to the New York City Municipal Sanatorium, Otisville, N. Y., there were only 19 (0.005 percent) patients with the disease, and in 1945 at Bellevue Hospital, New York, only 5 percent of pediatric tuberculous admissions, and only 20 (0.007 percent) of adult tuberculous admissions had tuberculous lymphadenitis (2). Nevertheless, though uncommon, the disease is of importance to the patient and to the physician, and an assay of the value of streptomycin in its treatment is appropriate.

It is the purpose of this article to present the results of streptomycin treatment in seven cases of tuberculous lymphadenitis showing what the drug did and did not accomplish.

Tuberculous lymphadenitis is a phase of the systemic disease tuberculosis. The classical concept of scrofula is one of cold abscess following cervical lymphadenitis. This was upset in 1826 when Cruveilhier (3) recognized pulmonary tuberculosis as "scrofula of the lungs," and today it is recognized that tuberculous lymphadenitis is inseparable from any manifestation of the disease, be the chief clinical manifestation pulmonary or extrapulmonary. The diagnosis of tuberculous lymphadenitis, therefore, does no more than state that the chief clinical localization is in the lymphatic system. It is recognized that at all times, tuberculosis is a disease involving the entire body, actually or potentially.

When tuberculosis occurs in a lymph node, a portal of entry is necessary. This may be any of the body orifices, including the ocular

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conjunctiva, the skin (3), or the dental roots (1). There the invading tubercle bacillus is phagocytosed by a polymorphonuclear leukocyte, and is transported to a regional lymph node. Poisoned by its engulfed prey, the leukocyte disintegrates, mononuclear cells appear, and tubercle formation begins. The process may remain localized and healing by calcification may occur; or, there may be local spread by direct extension through the lymph node capsule; or, bacilli may be transported via lymphatics to other regional lymph nodes; or, they may find their way into the blood stream and become widely and rapidly disseminated (3).

The pathologic changes in the local scrofulous process are divided by Bailey (1) into four stages. In stage 1, there is a caseation within the lymph node; in stage 2, disruption of the lymph node capsule with periadenitis; in stage 3, rupture through the deep cervical or other fascia, with collar button abscess; and in stage 4, perforation of the abscess through the skin with open drainage.

Clinically, the patient first notes swelling in the area of one or more groups of lymph nodes. The onset is seldom acute, and discomfort rather than pain is noted. There may or may not be history of previous similar episodes or of other tuberculous manifestations. Physical examination reveals regional or general lymphadenopathy, with cold abscess or sinus formation, depending on the pathologic stage of the process at the time of examination; there may be slight fever and evidence of coincident tuberculosis; and a complicating disease may be present. In support of the physical findings are a positive tuberculin test, a normal leukocyte count with relative lymphocytosis, and an elevated erythrocyte sedimentation rate. Anemia may be present in debilitated persons. Roentgenograms may reveal old lymph node calcifications in the neck or in other localities. Despite the most careful evaluation of the evidence, biopsy may be necessary to eliminate other lymphadenopathies, such as Hodgkin's disease. Boeck's sarcoid, and lymphopathia venereum. A serological test should be routinely done to rule out the bubo of syphilis.

There are five methods currently employed, alone or in combination, in the treatment of scrofula. These are: rest, heliotherapy, high voltage roentgen therapy, surgery, and streptomycin. Of these, rest, heliotherapy, and roentgen therapy are supportive measures, stimulating the local or general resistance of the body to the tubercle bacillus. Surgery is intended to remove the infected tissue. Streptomycin alone acts directly on the tubercle bacillus, interfering with its normal pathogenic activities (4). One would expect that a measure aimed against the invader would be, if not an exterminative, an incomplete treatment; in fact, such has proved to be the case.



In 1946, Hinshaw, Feldman, and Pfuetze (5) reported fistula closure in 2 of 5 cases of tuberculous lymphadenitis with sinus formation treated with streptomycin. In 1947 the Council on Pharmacy and Chemistry (6) found variable results in "a number" of noncaseating cases. Feldman and Hinshaw (4) reported success in "a high percentage" of cases (total number unstated) where sinus existed. Shameskin et al. (7) had success in 1 of 2 cases without sinus. Flory and others (8) reviewing the results of streptomycin treatment from the point of view of pathologic changes in tissue, found evidence of success in 2 out of 5 cases, none with sinus. Lester (2) using the drug as an adjunct to surgery, reported success in 10 out of 11 patients. Most recently, the Council on Pharmacy and Chemistry (9) found that in 51 patients with draining sinus, 45 improved; and in 36 without sinus, 12 were cured and 18 improved. They concluded that "lymphadenitis responded reasonably well to treatment with streptomycin."

In this hospital we have had opportunity to observe the effects of streptomycin in the treatment of 7 patients with scrofula in the past 18 months. This number of cases is small, but it represents 4.3 percent of the 163 cases of tuberculosis of all forms diagnosed during that period. Also, in a disease now considered rare, it constitutes a considerable number. All the patients were hospitalized and were kept either at bed rest or confined to the ward during treatment. One patient was initially treated elsewhere and came to us in relapse. This man had also received high voltage roentgen therapy. Otherwise, streptomycin and rest were the only therapeutic measures employed. The diagnosis in all cases was established by biopsy. Except where specified, roentgenograms of the chest were negative.

#### CASE REPORTS

*Case 1*—E. F. E., a 24-year-old Filipino, was admitted to the U. S. Naval Hospital, Portsmouth, Va., on 23 September 1947, complaining of a swelling over his right jaw of 3 weeks' duration. Treatment with sulfadiazine and penicillin elsewhere had been ineffective. Physical examination showed enlarged right preauricular and anterior cervical lymph nodes. A tuberculin test (using purified protein derivative, first strength) was strongly positive. Biopsy showed "necrotic lymphoid tissue." He was placed at bed rest and given streptomycin, 10 gm. daily to a total dose of 615 gm. Several months were allowed for convalescence. He was discharged on 23 July 1948, at which time the nodes were small and hard. On 18 November 1948 he was readmitted because of submental lymphadenitis. Biopsy revealed "a large area of central caseation" in a tuberculous lymph node.

*Comment*—This case was in an early pathologic stage when treated with streptomycin. The most likely portal of entry was the ocular conjunctiva. The disease appeared to be favorably influenced by streptomycin, but the effect was short-lived, and lymphatic extension to another area soon occurred. The treatment with streptomycin must therefore be regarded as a failure.

**Case 2.**—F G, a 22-year-old white man, was admitted 23 August 1948. He gave a history of drinking raw milk on the farm in childhood. At the age of 10 years, he had swelling in his neck on both sides which "stuck out as far as my ears." These were incised by a physician, and drained pus for several months. He was well until his twenty-first year when, in November 1947, he noted painful lumps in the left side of the neck. He was admitted to another naval hospital, where examination showed a "large swelling" below the left ear, external to the sternocleidomastoid muscle. A roentgenogram of the neck showed old lymph node calcifications. Biopsy showed "acute adenitis" in one node, and "caseous center, fibrous outer edge, minimum lymphoid tissue with heavy calcification" in another, "most probably tuberculous in origin." The tubercle bacillus was demonstrated on smear. He was treated with rest, streptomycin (90 gm. in 90 days), and simultaneous high voltage roentgen therapy (total 732 R units). He was readmitted to this hospital because of local recurrence of glandular swelling. Examination showed a robust young man with slight left anterior cervical lymphadenopathy and threatened sinus formation. There were old surgical scars present in the neck bilaterally. He was treated with bed rest followed by gradual exercise over a period of 6 months. Under symptomatic treatment the lymph nodes became small and hard. By February 1949 return to full active duty was possible.

*Comment*—This case illustrates the chronicity of scrofula and the ability of the tubercle bacillus to lie dormant in lymph nodes for 11 years. It also illustrates the ability of a vigorous youth to combat the disease, (on two occasions) with minimal treatment. Pathologically, it was in stage 3 when first seen here. It must be considered that both streptomycin and high voltage roentgen therapy failed in this case.

**Case 3.**—J A. J., a 23-year-old Negress, was admitted to the hospital on 16 April 1948. In 1940, at the age of 15, she was found to have pulmonary tuberculosis, and was treated with right pneumothorax. In 1944 the disease was considered to be arrested, and the lung was allowed to reexpand. At the age of 22, in April 1947, she first noted a transient swelling in her neck. This recurred in November 1947, and progressed in size until her admission. Physical examination at that time showed definite enlargement of the cervical lymph nodes in the right anterior and posterior cervical triangles, and a lesser enlargement of the lymph nodes in the left side of the neck. Biopsy was reported to show tuberculous lymphadenitis. Roentgenograms showed no evidence of previous lymphadenitis or of active pulmonary disease. The erythrocyte sedimentation rate was 24. She received streptomycin, 1.0 gm daily, for 42 days. There was little immediate response, but 4 months after the termination of treatment, when last seen, the glands were smaller and more firm and the patient was subjectively well.

*Comment*.—This is a case with a pulmonary portal of entry, lymphatic spread to the regional mediastinal lymph nodes, and, after a 7-year period of dormancy, further lymphatic spread to the cervical lymph nodes. Pathologically, it was in stage 2. Streptomycin was probably beneficial, although the ultimate prognosis remains unknown. There is not too much reason for gratification, since she had already experienced a spontaneous remission of the lymphadenitis about 1 year prior to the use of the drug.

**Case 4.**—H. A. Y., a 24-year-old white man, was admitted 19 April 1948 complaining of abdominal pain, bloating, and belching of about 1 week's duration. There was a past history of treatment for "mesenteric lymphadenitis" at the age of 9. Physical examination revealed a temperature of 99.6° F., a tender mass about

2 cm in diameter in the left lower quadrant of the abdomen, and moderate abdominal distention. A tuberculin test was strongly positive. The erythrocyte sedimentation rate was 22. Roentgenograms of the abdomen disclosed a large calcified mass in the mesentery opposite the fifth lumbar vertebra. A diagnosis of tuberculous mesenteric lymphadenitis was made. Because of threatened intestinal obstruction treatment with a Miller-Abbot tube was necessary, also treatment with streptomycin, 10 gm daily, was begun. Within 1 week the patient was symptom-free and his fever had disappeared. Later the gastrointestinal tract was examined roentgenographically with a barium meal. This showed partial small bowel obstruction. Streptomycin was continued to a total dose of 400 gm. The abdominal mass shrank but did not disappear. On discharge, 12 August 1948, the patient was clinically well.

*Comment*—This case is an example of an intestinal portal of entry, long dormancy, and local recurrence. In all probability, the local periglandular tissues (mesentery and intestinal wall) were involved. Streptomycin apparently obviated surgical intervention for intestinal obstruction, which, in the circumstances, might well have resulted in chronic fistula formation. Even if there is recurrence later, the drug served its purpose at the time.

*Case 5*—L. R., a 24-year-old Negro, was admitted on 27 March 1948. He complained of the loss of 60 pounds of weight in the past 8 months, accompanied by nervousness and sweats. In the 10 days prior to admission he had had fever, chills, swelling of the ankles, and painful lumps in the groin. Physical examination showed an acutely ill man with a temperature of 102° F., pulse 120, and blood pressure 145/70. There was emaciation, exophthalmos, diffuse goiter, swollen legs, tender ankles, and generalized lymphadenopathy. The inguinal lymph nodes were tender. There was slight anemia. The Frei intradermal reaction was positive. A therapeutic test for lymphopathia venereum with sulfadiazine was unsuccessful. Lymph node biopsy showed tuberculosis. The basal metabolism rate taken in a fever-free interval was plus 51 percent. A diagnosis of simultaneous hyperthyroidism and tuberculous lymphadenitis was established. Streptomycin, 10 gm per day, and propylthiouracil were administered. The total dose of streptomycin was 420 gm. The patient regained 30 pounds of weight, and the lymph nodes became smaller and harder. On 4 August 1948 a subtotal thyroidectomy was performed (Pathologic diagnosis: Hypertrophic parenchymatous colloid thyroid). On 15 August 1948 the basal metabolism rate was minus 15 percent. On discharge, 20 August 1948, he was subjectively and objectively well.

*Comment*—In this case of simultaneous hyperthyroidism and tuberculosis of the lymph nodes, the portal of entry of the tubercle bacillus is unknown. Pathologically, the lymphadenitis was in stage 1. Streptomycin was probably life-saving, since without it subtotal thyroidectomy would probably have been followed by complications. This is another instance in which, even if there be relapse, the drug was of great value at the time it was used.

*Case 6*—J. G., a 23-year-old Negro, was admitted to the hospital on 13 October 1948 complaining of lumps in the groin. A "cyst" had been incised in the right groin 4 months previously, with evacuation of pus. Lymph node biopsy showed "hyperplastic, noncaseating tuberculosis." Physical examination showed low grade pyrexia and generalized lymph node enlargement, especially noticeable in the inguinal areas. A roentgenogram of the chest showed extremely enlarged hilar lymph nodes. The second strength purified protein derivative gave a positive reaction. Apart from this and except for the evidence on biopsy, the clinical picture suggested Boeck's sarcoid. Forty-two grams of streptomycin

were administered in 42 days. There was some regression of the surface, but none of the hilar lymph nodes. No follow-up is available.

*Comment.*—The portal of entry in this case is unknown. Spread was probably military. Pathologically, the process was in the first stage. The observed effects of streptomycin were minimal.

*Case 7.*—E. B., a 23-year-old white man, was admitted to the hospital on 19 November 1948. As a child, he drank raw milk on the farm. He stated that the herd was tuberculin tested. In July 1948 he noted a lump in the right armpit. On admission, enlarged right axillary lymph nodes were found. On aspiration, pus was encountered. Biopsy showed tuberculous lymphadenitis. A fistula developed at the site where tissue was removed for biopsy. He received 47.0 gm. of streptomycin in as many days. The fistula closed in about 1 month. On 8 April 1949 lymph nodes were normal in size.

*Comment.*—The portal of entry in this case is unknown. The disease progressed rapidly, partly as a result of diagnostic procedures, from pathologic stage 2 to stage 4. Streptomycin apparently arrested the disease, but the follow-up is too short to justify the word "cure."

#### COMMENT

The results from the use of streptomycin in these seven cases of tuberculous lymphadenitis may be summarized as follows: The immediate treatment result was poor in one, and good in six. In two, the drug was unquestionably of great value, regardless of the eventual outcome, since in one it obviated surgery for intestinal obstruction, and in the other it prepared the patient for operation for coincident thyrotoxicosis. On the other hand, in two, in whom a follow-up of 1 year was possible, relapse occurred. This fact renders enthusiasm based on an initial success unwise.

In the two who showed relapse, the recurrent lymphadenopathy subsided over a period of months under treatment with rest and heliotherapy. Since recovery was not uncommon in the prestreptomycin era with these simple measures, there is reason to doubt the desirability of using this drug in the ordinary case of scrofula, the more so since the tubercle bacillus is likely to become resistant to streptomycin, and it may later be ineffective when more urgently needed by the patient.

It will be noted that most of our patients were in an early stage and that fistula formation occurred in only one. This patient responded promptly to the drug. This is in accord with the usual observation that streptomycin is most useful in so-called surgical tuberculosis where drainage exists.

In general, it is probable that streptomycin alone is not a complete treatment for tuberculous lymphadenitis and that it is best reserved for use in the case with fistula or other complication.

#### REFERENCES

1. BAILEY, H.: Tuberculous cervical adenitis. *Lancet* 1: 313-316, Feb. 1948.
2. LESTER, C. W.: Tuberculosis of the cervical lymph nodes. *Surg., Gynec. & Obst.* 87: 719-724, Dec. 1948.

- 3 CALMETTE, A.: Tubercle Bacillus Infection and Tuberculosis in Man and Animals. Williams & Wilkins Co. Baltimore Md. 1922
- 4 FELDMAN, W. H. and HINSHAW, H. C. Streptomycin. A valuable anti tuberculous agent. Brit M J 1. 87-92 Jan 17, 1948.
5. HINSHAW, H. C., FELDMAN, W. H., and PELETZ, K. H. Streptomycin in treatment of clinical tuberculosis. Am Rev Tuberc 51: 191-201, Sept 1946
- 6 COUNCIL ON PHARMACY AND CHEMISTRY. The effect of streptomycin on tuberculosis in man. J. A. M. A 135: 634-641, Nov 8, 1947
- 7 SHAMESKIN, A.; MORRIS, L. C.; DES AUTELS, E. J.; MUNDLIN, J.; ZVETINA, J. R.; and SWEANEY, H. C.: Streptomycin in treatment of pulmonary tuberculosis. Am Rev Tuberc 56: 540-551 Dec 1947
8. FLORY, C. M., CORRELL, J. W.; KIDD, J. G., STEVENSON, L. D., ALVORD, E. C., Jr., McDERMOTT, W. and MÜSCHENHEIM, C.: Modifications of tuberculous lesions in patients treated with streptomycin. Am Rev Tuberc 58: 421-448, Oct 1948
- 9 COUNCIL ON PHARMACY AND CHEMISTRY. Streptomycin in the treatment of tuberculosis. J. A. M. A 138: 584-593, Oct 23, 1948.



**A PRELIMINARY REPORT ON HYDROCEPHALUS, SPINA BIFIDA AND OTHER CONGENITAL ANOMALIES IN THE RAT PRODUCED BY TRYPAN BLUE, by J. Gillman, Christie Gilbert; T. Gillman; and Isobel Spense. The South African Journal of Medical Science 13: 47-90, March 1948**

Gillman *et al* injected trypan blue into rats. Gross malformations such as ocular defects, spina bifida, tail defects, and hydrocephalus appeared in 19.2 percent of the offspring. If the female rat received an injection before conception as well as an additional dose during pregnancy, 25 percent of the offspring were abnormal. By giving an injection of trypan blue on the seventh day before conception and the seventh day after conception, 80 percent of the litter were abnormal, if only one injection was given on the day before conception 25 percent of the litter were abnormal. A high neonatal mortality, a reduction in the size of the litter, a low birth rate, and a retardation of postnatal development was manifest. They found that trypan blue was bound to the plasma albumin and did not enter the fetus or the amniotic fluid or amniotic epithelium, and that all embryonic tissues except the yolk sac were free. They believe that trypan blue causes anomalies in an offspring by producing such preceding metabolic disturbances as to interfere with the subsequent fetal development—*Abstract*



# About the Army Medical Department

## III. Emergency Personnel Planning<sup>1</sup>

PAUL I. ROBINSON, *Colonel, MC, U. S. A.*<sup>2</sup>

A LETTER to the surgeons of major overseas commands concerning the anticipated shortage of medical officers that will occur this summer was quoted in the March issue of the *Armed Forces Medical Journal* in order that the various steps in planning to meet this particular emergency could be seen.

A few days after this letter was dispatched a meeting was held with the Deputy Chief of Staff, U. S. Army, in which all phases of the problem were discussed. Not the least among the problems to be surmounted in sending a large number of physicians overseas for 3 months were the funds from which their temporary duty travel and per diem could be paid. The Surgeon General was willing to curtail much of the ordinary temporary duty travel of his own personnel in order to meet the emergency. It was considered unfair to prevent officers so assigned from receiving the normal per diem. It was, therefore, decided that per diem would be furnished in accordance with the present regulations, which are determined in each case but in general might be said to be as follows: (a) \$7 a day for the first 30 days, if no quarters are available; (b) \$4 a day if quarters are available; (c) \$4 a day for the second 30 days, if no quarters are available; (d) \$2 a day if quarters are available; (e) \$2 for any period after the second month, if no quarters are available; and (f) no per diem if quarters are available.

The personnel staff officers of all major overseas commands were in Washington at the time of this meeting and the proposition was presented to them, with the inquiry as to whether transportation within the command would be charged against these temporary duty

<sup>1</sup> Continued from the March issue.

<sup>2</sup> Personnel Division, Office of the Surgeon General.

funds. It was universally stated that travel within the command would be by Government transportation. The personnel representatives also stated that bachelor officers' quarters would be furnished to every officer. These two facts lowered the amount of temporary duty funds required to the point that they could be met by the Department of the Army. The officers from the various commands were asked if careful planning could be accomplished within the command to assure no waste of time, in order that each officer sent on temporary duty could be used to the fullest extent. All stated that this planning would be accomplished.

Thus, it was determined that no more than 100 residents would be used on this temporary duty. The Navy was unable to loan the Army any physicians who were on active duty but was willing to ask for Reserve medical officers to come on duty for this period if the Army so desired. The Army also considered whether or not it was feasible to ask Reserve medical officers to come on duty for this period. It was determined that only sufficient funds were available to send the 100 residents previously mentioned. In view of the emergency nature of this problem and the administrative difficulties involved in ordering Reserve officers to active duty, it was not considered practicable to use such personnel. It was further decided that the number of medical officers on duty in the Army areas could not be reduced, even temporarily, without endangering military preparedness. The use of civilian physicians in overseas commands was not practicable because their allowances would have to come from funds which are extremely limited.

The next step was to send a letter to the hospitals with their quotas by military occupational specialty number. The situation was carefully explained so that everyone in the teaching hospitals would be thoroughly cognizant of the nature of the emergency. Each of the hospitals was asked to supply the Personnel Division of the Surgeon General's Office with the names of the officers selected to fill the various quotas. The same proportion of residents was taken from each of the hospitals—with due allowance for programs in which there was only one resident. Each hospital was notified that the selected officers would be authorized per diem and that air transportation would be furnished from the United States to the command. They were also told that dependents could not accompany the officers for this period of duty. Only first- and second-year residents were selected because it was to everyone's advantage to allow the senior residents to finish their program and thus become available for regular duty on 1 July. Everyone was notified that those used in this emergency would go back into the training program for the completion of their

current year of training, even though it extended their time in the hospitals.

This program was received with reasonable enthusiasm by the residents themselves. In only a few instances was it necessary for the hospital commanders to make the selection since the quota was largely filled by volunteers. This plan has the advantage of allowing these residents to visit remote places for a short time, in addition to rendering a distinct service to their country.

The overseas commands, while not satisfied with the number of medical officers being furnished indicated that they were satisfied with the efforts we were making to assist them in this period. Much of the elective medical and surgical work that would ordinarily be done during these months will have to be curtailed.

Since the Air Force also has residents in the Army teaching hospitals, the Surgeon General of the Air Force was advised of our plan and the policy was established that should any of the officers selected to fill this quota transfer to the Air Force, orders would be issued for these officers to complete the emergency mission.

The surgeon of one of the overseas commands stated that he would like it explained to all officers that the bachelor quarters available are not luxurious; and opportunities for travel on pass or leave will be almost impossible during the period when the officers are on temporary duty. He strongly urged that wives do not visit their husbands while they are overseas because hotel or other living accommodations could not be provided for them and their expenses would be high. Aside from these considerations everything will be done to make the tour of temporary duty both pleasant and profitable.

In addition to these emergency measures concurrent planning for permanent assignments is proceeding normally. About 260 medical officers on Reserve status have been sent a questionnaire in which they were asked to state their preference for assignments, their present family situation, and other pertinent information that would be useful in determining their assignment. Fourteen have already indicated their preference for a Regular Army career and have applied for a Regular Army commission. Selections will be made from this group for a few openings in the newly established courses in military medicine to be given this fall and winter at the Army Medical Center, Washington, D. C., and the Army Medical Center, Fort Sam Houston, Tex.

The overseas commands have preference on the remainder of the available officers. The combined requirements for officers having the qualifications of this group are 241. The number available falls short of the goal by 18 percent. A numerical goal, by command, was therefore established to fill 82 percent of the requirements for each of the



overseas commands. Requirements for the Far East Command can never be met from first choices; whereas, the opposite is true of the European Command. Because there are many locations in the Far East Command where living conditions are not suited to family life, single officers were placed on the Far East list. There were still 23 officers to be selected and this selection was made from married officers who did not have children and from officers who contemplated marriage before the date of their shipment.

Selections of a few officers had to be made for the smaller commands such as Trieste and Alaska. To meet the quota for Trieste, a single officer was selected who had made a special plea for assignment to the European Command because of the Holy Year, since he was a Catholic. Further justification for the selection of a single officer for this assignment was a recent directive regarding nonshipment of dependents to Trieste because of the generally poor housing accommodations. The quota for Alaska was two officers. After carefully screening those available one officer from northern Wisconsin and one from North Dakota were selected; one was married and had no children; the other was single. These two officers were selected because of the probability that they would enjoy an assignment in a cold climate better than officers who had not been accustomed to Northern climates.

The list was then reviewed for officers to fill the quota of 16 for the Caribbean Command. Quarters are generally available for married personnel in the Caribbean Command and only married officers with dependents were selected for this assignment. Another criterion that was used was nearness to the port of embarkation in order that the maximum amount of travel funds could be conserved. Of the remaining group, two officers had indicated a preference for Hawaii. These two were selected to meet the quota of 16, the rest being selected from married officers who had named the Caribbean Command as first or second choice, but were closer to San Francisco than to the east coast.

These selections left a group who had all given the European Command as first choice. All were married, although not all of them had children. To meet a quota of 5 for Austria, 4 were selected alphabetically from the top of the list. One single officer was selected for assignment to Austria because of his ability to speak Czechoslovak. Nine officers from this group have indicated that they expect to have children born this summer. All of them have been temporarily assigned as near to their homes as possible, and their shipment to overseas stations has been deferred until after 1 January 1951. These are

a few examples of our attempts to individualize assignments insofar as possible. The Personnel Division is striving to improve its career assignments as they pertain to the use of personnel, and is always glad to discuss with any officer the reasoning that has gone into his particular assignment.



CAUSES FOR AMPUTATIONS PERFORMED AT WALTER REED GENERAL HOSPITAL DURING 1947 AND 1948, by August W. Spittler, *Colonel, MC, U. S. A.*; and Lloyd W. Taylor, *Lieutenant Colonel, MC, U. S. A.* *Journal of Bone and Joint Surgery* 31A: 800-804, Oct. 1949.

Although no amputations were performed for osteomyelitis alone, this disease still takes first place as a major contributing cause of amputation. Except for apparent systemic benefit to a patient during acute flare-ups of osteomyelitis, sulfonamides and antibiotics have contributed little to the cure of adult patients with chronic draining osteomyelitis. In planning a reconstructive program of rehabilitation on an injured extremity, the percent of successful end results is in inverse ratio to the number of operations required to produce that result.

The authors conclude that: (a) Unilateral amputation is not a contra-indication to amputation of the contralateral extremity; (b) skin grafting of any type to full weight-bearing surfaces is so highly unsatisfactory as to condemn the procedure; (c) elective sacrifice of the fibula in a reconstructive program is highly unsatisfactory; (d) a Syme's amputation is the best major amputation through an extremity; (e) when amputation is a possibility, surgical incisions should be placed in such a manner as to insure amputation at the lowest possible level should this procedure later become necessary; (f) when amputation is a possibility, the removal of cancellous graft from the ilium should be accomplished on the affected and not on the contralateral side; and (g) needless operative procedures that promised little possibility of success were performed on many of the patients studied, causing prolonged months of hospitalization, psychic trauma, and generalized systemic damage, secondary to prolonged periods of chronic infection. Early evaluation of these cases, and applying sound surgical principles could have prevented many of these undesirable results. The principle most often disregarded in these cases was that amputation is a sound method of treatment and not a last resort.—*Abstract.*



THE PHYSICIAN MUST KNOW  
WHAT HIS PREDECESSORS HAVE  
KNOWN IF HE DOES NOT WISH  
TO DECEIVE BOTH HIMSELF AND  
OTHERS — *Hippocrates*

## EDITORIAL

### The Periodic Physical Examination

The primary function of the physician is to recognize disease in its earliest phase in the asymptomatic person. This must be a fundamental concept in the practice of medicine if the physician is to avoid the dilemma of recognizing a disease when its symptoms and signs are pathognomonic and evidence of advanced pathologic changes—it is then too late for early and effective treatment.

Except in the fulminating types of organic diseases and the acute infections, a period of a year or two exists between the time of the appearance of early pathologic tissue changes and pathognomonic signs and symptoms. It is in this interval, and particularly during the early phases of the pathologic process, when the diagnosis must be made. The symptoms then are apt to be vague and of a minor nature, and thus may be misleading, or the patient may be asymptomatic. However, upon examination, clinical and laboratory evidence of disease can often be detected.

Examples of this period of latency are the following: (a) When malignant tissue remains after surgical resection, the interval between surgical removal of the cancer and the recurrence is about 15 to 20 months, or longer. If this is the latency period when cancer is already present, then the interval between the time of earliest tissue invasion and the time of appearance of the textbook description of a chronic organic disease or a malignant lesion probably is much longer. In the interval the patient may have been asymptomatic or else symptoms of a vague or minor nature may have been present. (b) The normal kidney can excrete urine of a specific gravity of 1022 or higher; if the kidney cannot excrete urine of a specific gravity higher than 1020 there exists moderate glomerular and tubular injury. When the kidney cannot excrete urine of specific gravity over 1010 it has undergone extensive glomerular and tubular damage, and extensive fibrosis. During this period of progressive pathologic changes, the patient probably remained asymptomatic until the symptoms of glomerulonephritis, such as dependent edema, dyspnea, and headache, appeared.

(c) In arteriolar nephrosclerosis, mild renal damage may exist and yet there may be no alteration in the chemistry of the urine because the minimal increase in blood pressure was sufficient to supply the glomeruli and the tubules with the necessary amount of blood under adequate pressure and, therefore, glomerular filtration remained normal. When albuminuria, cylinduria, hypertension, and edema appear the pathologic renal changes are then already far advanced. (d) Sir Thomas Lewis observed that if the total capacity of the healthy heart for work is taken at 10 units, only one unit is required to maintain a normal circulation while the body is at rest; the remaining 9 form the reserve. He points out that, in cardiac failure, by the time congestion sets in, nine-tenths of the heart's capacity to perform its task have been lost. In this interval the only symptoms indicative of cardiac disease may have been breathlessness occurring after some act previously performed without undue breathlessness, or the occurrence of vague precordial discomfort or palpitation.

There are many chronic diseases in which the detection of an organic or neoplastic lesion in an asymptomatic person lies within the capabilities of the physician, provided periodic physical examinations are done and provided clinical acumen is correlated with every means of diagnosis ordinarily available. To do this requires (a) an evaluation of a thorough, detailed, clinical history paying particular attention to vague or what appear to be minor complaints. Often a careful interrogation will be required to elicit symptoms which the patient may not otherwise volunteer. (b) The examiner must seek evidence of the presence of organic changes rather than physical defects which reflect changes in function incident to age and which do not affect health. The thorough physical examination, in addition to percussion, auscultation, and palpation, must include an inspection of every visible organ and tissue—the larynx, as well as the cervix, rectum, and the sigmoid; palpation of the breast, digital examination of the rectum in the knee-chest position (4 out of 5 rectal carcinomas are within the reach of the examining finger), and of the prostate always must be done; and a sigmoidoscopic examination is necessary to detect malignant changes anywhere below the middle third of the sigmoid.

To imply that a negative result obtained after percussion and auscultation of the lungs of the asymptomatic person is indicative of the absence of organic or neoplastic lesion of the lung, jeopardizes the physical welfare of the person examined. A roentgenogram of the lungs must be made on a 14×17-inch film if a peripheral organic or neoplastic lung lesion is to be discovered at the earliest possible moment. A roentgenologic study of the stomach and the gastrointestinal tract must be done whenever there is a family history of gastric carcinoma. A hemoglobin determination and red and white blood cell

*counts are required to detect disease of the hemopoietic system; and the entire quantity of urine excreted during a period of 24 hours must be examined, for it is not possible to estimate the function of all the glomeruli and the tubules if only a single specimen of urine is examined. An electrocardiogram and other clinical and laboratory examinations including the method of cytologic diagnosis of Papanicolaou, will be required, depending upon the evaluation of clinical history and physical findings.*

If a disease is to be arrested or cured early, the diagnosis must be made in the interval between the occurrence of the early pathologic tissue changes and the appearance of pathognomonic signs and symptoms. This is the challenge that the physician must meet if progress in the methods of clinical diagnosis is to keep pace with the recent advances in biochemistry, surgical technique, and therapeutics.

—J. L. S



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**OPERATIVE TECHNIC IN SPECIALTY SURGERY**, edited by Warren H. Cole, M. D., F. A. C. S., *Professor and Head of the Department of Surgery, University of Illinois College of Medicine, Director of Surgical Service, Illinois Research and Educational Hospitals, Chicago*. Introduction by Allen O. Whipple, M. D., F. A. C. S. 725 pages, illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1949. Price \$14.

This book is made up of a composite group of chapters, each devoted to a different branch of surgery. Each is written by a different author who is well-known as an outstanding authority in his field. The book contains much information of interest to the student and specialist but will be of most interest to the general surgeon whose work is more or less involved with most of the surgical specialties. There are no chapters dealing with ophthalmology or otolaryngology. The book is not an atlas nor is it a reference library, but it is a useful adjunct to a surgeon's library as it contains much condensed practical and up-to-date information on operative therapeutics.

The opening chapter deals with plastic surgery in which the general principles are stressed more than specific details of individual operations. However, some of the procedures are illustrated by multiple-stage illustrations. Following this is a chapter on thoracic surgery and repair of diaphragmatic hernias. The operative procedures for various thoracic lesions are described except for the heart, which, together with the mediastinum, is covered in the chapter that follows. The latter is particularly interesting in its description of how to repair penetrating wounds of the heart and how to recognize cardiac compression. Following this there are several chapters devoted to orthopedic surgery beginning with the operative therapy of fractures, then one about osteomyelitis, followed by one on deformities and neoplasms of bone, proceeding to a chapter which deals with operative approaches to joints and containing some excellent illustrations, followed by a final chapter which discusses the surgical procedures used to help correct the deformities caused by spastic paralysis and anterior poliomyelitis.

The next five chapters deal with surgery in relation to the various parts of the nervous system and its coverings. The first of these involves the general principles of closure of scalp wounds, the method for preparing a flap in different areas of the scalp and closure of defects, and finally the method of dealing with various brain lesions. Next is a chapter devoted to the surgical problems which

can be performed on them. A chapter dealing with the peripheral nerves contains a number of good illustrations showing the proper approaches, and the disfiguring scars resulting from poorly planned approaches. The materials used in repair and the technique of suturing nerve trunks are discussed and illustrated. The last chapter on the nervous system concerns the various types of sympathectomy together with the technique of performing these operations as well as the method used to perform a lumbar and thoracic paravertebral sympathetic block.

In a chapter on gynecological surgery the author describes a method for performing all the usual types of pelvic surgery and gives the indications, together with the advantages and disadvantages to be considered. A more lengthy discussion of the procedure used in radical hysterectomy for cervical cancer, and that for radical groin dissection in cancer, is included.

The final chapter is devoted to the male genito-urinary system and following a short opening discussion of anatomical considerations, symptoms, and methods of diagnosis, the author discusses the operations performed in this region.

In conclusion it may be stated that this is an up-to-date treatise written by a group of America's leading surgical specialists. The discussions are short and to the point and written so that the directions are readily followed. A bibliography is included at the end of each chapter. It is an excellent book for the practicing surgeon who wishes to learn what an excellent authority does without searching through lengthy volumes.—*Commander C. D. Burroughs, (MC) U. S. N.*

ORGANIC CHEMISTRY IN PHARMACY, edited by Charles O. Wilson, Ph D Professor of Pharmaceutical Chemistry Chairman of the Department of Pharmaceutical Chemistry, University of Tennessee, Knoxville, Tennessee. 622 pages. Illustrated. Price \$9.

With the assistance of a staff of experts, the authors have produced an up-to-the-minute text that should be welcomed by teachers, students, and professional pharmacists.

The book has as its stated objective the presentation of the essential pharmaceutical knowledge of the organic chemical substances used in pharmacy and medicine. As a text, it is designed for a course in organic pharmaceutical chemistry based upon a general course in organic chemistry and preceding courses in pharmacology. To fit into this position in the curriculum, each chapter is opened with a review of the basic principles of the class and to orient the student in the relationship between chemical structure and pharmacological uses, chapters are included on physical properties in relation to biologic action and metabolic changes of drugs and related organic compounds in the body. In addition, brief references are made to pharmacologic action in the discussion of individual compounds.

Compounds are presented in the order of chemical constitution as aliphatic, aromatic, heterocyclic, and other cyclic types, with special chapters on sulfur compounds, compounds containing heavy metals, dyes, surface-active agents, alkaloids, antibiotics, vitamins and proteins, and amino acids. Working formulas are given where feasible and all important structural formulas have been incorporated in the text. In areas of active research, the authors look forward with the inclusion of many compounds which are still in the laboratory stage of development.

In striking contrast to most organic chemistry books, this one is scientifically accurate and at the same time is pleasantly readable. It is well indexed, and

many original source references are given. It is well arranged and excellently printed. Organic Chemistry in Pharmacy will be well received and will be a valued addition to the literature of pharmacy.—*Commander W. P. Briggs, (MSO) U. S. N.*

## BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

**NEUROLOGY**, by Roy R Grinker, M D, *Director of the Institute for Psychosomatic and Psychiatric Research and Training and Chairman, The Department of Neuropsychiatry of the Michael Reese Hospital, Chicago, Ill.*, and Paul C Bucy, M D, *Professor of Neurology and Neurological Surgery, University of Illinois College of Medicine, Chicago, Ill.* 4th edition, completely revised and reset in new type. 1 134 pages, illustrated Charles C Thomas, Springfield, Ill., publishers, 1949. Price \$12 50

**THE PRACTICE OF REFRACTION**, by Sir Stewart Duke-Elder, K C V O, M A, D Sc (St. And.), Ph D (Lond.), M D, F R C S, Hon D S C (North Western), *Surgeon-Oculist to H M The King, Knight of Grace of the Order of St. John; Consulting Ophthalmic Surgeon to the Army and the Royal Air Force, Director of Research, Institute of Ophthalmology, University of London, Consulting Ophthalmic Surgeon, Moorfields Westminster and Central Eye Hospital; Ophthalmic Surgeon, St. George's Hospital* 5th edition 317 pages, with 216 illustrations The C V. Mosby Co., St. Louis, Mo., publishers, 1949 Price \$6 25

**HUMAN HELMINTHOLOGY**, A Manual for Physicians, Sanitarians, and Medical Zoologists, by Ernest Carroll Faust, A B, M A, Ph D, *The William Vincent Professor of Tropical Diseases and Hygiene, Head of the Division of Parasitology, Department of Tropical Medicine and Public Health, The Tulane University of Louisiana, New Orleans, La.* 3d edition, revised 744 pages, illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1949 Price \$10.

**ROENTGEN DIAGNOSIS OF THE EXTREMITIES AND SPINE** (Annals of Roentgenology, Vol XVII), by Albert B Ferguson, M. D. 2d edition, revised and enlarged 519 pages, illustrated. Paul B Hoeber Inc. New York, N Y., publishers, 1949 Price \$15

**HEMATOLOGY FOR STUDENTS AND PRACTITIONERS**, by Willis M Fowler, M. D., *Professor of Internal Medicine, University of Iowa, Iowa City, Ia.*, with a chapter by Elmer L. DeGowin, M D, *Associate Professor of Internal Medicine, University of Iowa, Iowa City, Ia.* 2d edition, revised 535 pages, illustrated Paul B Hoeber, Inc., New York, N Y., publishers, 1949 Price \$8 50

**MALIGNANT DISEASE AND ITS TREATMENT BY RADIUM**, by Sir Stanford Cade, K. B E., C B, F R C S, M R C P, *Surgeon, Westminster Hospital, Mount Vernon Hospital and Radium Institute, Lecturer in Surgery, Westminster Hospital Medical School and formerly Examiner in Surgery, University of London; Member of the Court of Examiners, late Hunterian Professor and Arris and Gale Lecturer, Royal College of Surgeons of England; Member of the National Radium Commission and Trust, Consultant in Surgery to the Royal Air Force,* with a Foreword by Sir Ernest Rock Carling, F R C P, F R C S, F F R, *Consulting Surgeon and Vice-President, Westminster Hospital* Volume II, 2d edition. 430 pages, illustrated The Williams & Wilkins Co., Baltimore, Md., publishers, 1949 Price \$12 50

**TEXTBOOK OF MEDICINE**, edited by Sir John Conybeare, K. B E., M. C., D M. (Oxon.), F R C P., *Physician to Guy's Hospital, London* 9th edition 875 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1949. Price \$6

**HELP YOURSELF TO BETTER SIGHT**, by Margaret Darst Corbett 218 pages. Prentice-Hall, Inc. New York, N. Y., publishers, 1949 Price \$2 50.

**OPERATIONS OF GENERAL SURGERY**, by Thomas G Orr, M D, *Professor of Surgery, University of Kansas School of Medicine, Kansas City, Kans.* 2d edition 890 pages with 1,700 step-by-step illustrations on 721 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949 Price \$13 50.







*The Journal is indexed in  
the following publications*

*Current List of Medical Literature*

(Army Medical Library) Weekly listings of  
journal contents by author subject index  
monthly

*Quarterly Cumulative Index Medicus*

(American Medical Association) Author and  
subject

*Index-Catalogue of the Library of the Surgeon  
General's Office, U. S. Army*

(Army Medical Library) Now in Fourth Series.  
Vol. X, Letter M (first half) Author and  
subject.

COVER PHOTOGRAPHS

*X-ray room, ward, and operating room  
of an Armed Forces Medical Dispensary*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

RICHARD L. MEILING, M. D.,  
*Director, Medical Services,  
Department of Defense.*

RAYMOND W. BLISS,  
*Major General, U. S. A.,  
Surgeon General, U. S. Army.*

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*The opinions expressed in this publication are not necessarily those of the Department of the Army, Department of the Navy, Department of the Air Force, or Department of Defense. References to regulations, orders, circular letters, or directives are for information only and do not, by publication herein, constitute authority for action.*

*Any reference in an article of this publication to a proprietary drug or its chemical formula shall not constitute an endorsement of its efficacy or use in the treatment of any disease.*

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#### SUBSCRIPTION PRICE OF THE JOURNAL

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Exchange of publications will be extended to medical and scientific organizations, societies, and journals. Communications on this subject should be addressed to the Editor, UNITED STATES ARMED FORCES MEDICAL JOURNAL, Potomac Annex, Navy Department, Washington 25, D. C.

#### REFRINTS

The Superintendent of Documents will furnish, on request, prices for reprints of 100 or more copies of articles contained in the UNITED STATES ARMED FORCES MEDICAL JOURNAL. Orders for reprints must be placed within 2 months after date of publication.

For prompt attention, requests must be addressed as follows: Superintendent of Documents, Attention: Procurement Section, Government Printing Office, Washington 25, D. C.

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Contributions to the MEDICAL JOURNAL should be typewritten double-spaced with wide margins on plain paper of standard letter size. Nothing should be written in the manuscript that is not intended for publication.

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Contributions are to be the original work of the author. Quotations must be accurately and carefully copied and full credit must be given to the source. References, tables (charts), and legends must be double spaced and on separate sheets. Bibliography should be listed according to the Index Medicus, A. M. A. and the sequence should be as follows: name of the author and initials, title of article; name of periodical, volume number, pages, and month and year. *Example.* Hinton, D., and Steiner, C. A.: Recurrent volvulus of sigmoid colon; unusual case report. *Ann Surg* 116: 147-149 July 1942. Authors are responsible for the accuracy of the bibliographical references.

The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

The editor is not responsible for the safe return of manuscripts and illustrations. All material supplied for illustration, if not original, must be accompanied by reference to the source and a statement that reproduction has been authorized. Recognizable photographs of patients should carry permission to publish.

All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without the permission of the Editor, UNITED STATES ARMED FORCES MEDICAL JOURNAL, and that editorial privilege is granted to the UNITED STATES ARMED FORCES MEDICAL JOURNAL in preparing all material submitted for publication. Authors are urged to keep their papers short.

Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery, Department of the Navy, Washington 25, D. C.

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## Announcement

The Director of Medical Services, Department of Defense, and the Surgeons General of the Army, Navy, and Air Force are sponsoring a session on Military Medicine and Surgery at the American Medical Association meeting in San Francisco. The session will be held the mornings of 28-29 June under the section on Miscellaneous Topics. The program will be presented by nationally outstanding civilian and military scientists who will cover professional problems of military medicine and surgery which will greatly interest all physicians concerned about national defense. The chairman of the session is Dr. Wendell G. Scott, of St. Louis, with Dr. A. Randolph Lovelace, of Albuquerque, as vice chairman and Col. William S. Stone of the U. S. Army Medical Corps as secretary. All medical officers and other physicians interested in civil or other phases of national defense are urged to attend.

The tentative program of this session is printed on the inside of the back cover of this issue.



OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

MEMO. Personnel of the Medical Services, the United States Armed Forces

Many military leaders in the field of hospital management have felt that various improvements developed in outstanding hospitals and in industry, could be applied profitably to military hospital management, both as a means of permitting the physician to give more and better care and to meet the problem of steadily mounting hospital costs.

More than a year ago, the U. S. Army Medical Department, with the cooperation and coordination of many other staff agencies of the Department of Army, pioneered a research program to modernize hospital management methods. After study, a carefully conceived pilot program was set up in a selected Army hospital incorporating the most modern principles and the best thinking of the outstanding hospitals and operating staffs of the Army, Navy and Air Force.

This pilot project was extremely successful.

There has been established in the Office of Medical Services, with the concurrence of the three Surgeons General, a staff group which is mapping plans for use of these improved hospital management methods in the programs of the three military services.

*Richard L. Hedberg*

Richard L. Hedberg, M.D.  
Director of Medical Services

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

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BLDG&T, OCTOBER 19, 1949

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## Atabrine in the Treatment of Cardiac Arrhythmias

CHARLES H. EATON, *Lieutenant Commander (MC) U. S. N.*<sup>1</sup>

ROBERT L. HILL, *Lieutenant, junior grade (MC) U. S. N.*<sup>1</sup>

**A**TABRINE can be used as a substitute for quinidine to convert auricular fibrillation and other abnormal cardiac rhythms to a normal sinus mechanism (1).

Chemically unrelated compounds often possess similar pharmacologic actions. For example, the antimalarial activities of quinine and atabrine (quinacrine hydrochloride) are well known, but they are unrelated chemically.

Similarly quinidine, an optical isomer of quinine, and atabrine have many similar physiological actions: both inhibit cholinesterase from the electric organ of *Electrophorus electricus* (2), dilate coronary vessels in perfused rabbit hearts (3), inhibit vagus-stimulated gastric secretion (4), increase the refractory period and decrease the excitability of perfused rabbit (5) and frog hearts (6), and paralyze vagus-inhibitory fibers to the dog's heart (1) (7).

<sup>1</sup> U. S. Naval Hospital, Long Beach, Calif

Quinidine has been used for many years to restore auricular fibrillation and other cardiac arrhythmias to regular sinus rhythm. Its actions include lengthening the refractory period and decreasing the rate of conduction in the auricular muscle, decreasing the vagus inhibitory effect on the auricle, and depressing auriculoventricular conduction. These actions combine to abolish the "circus" movement, and allow the sino-auricular node to again assume the role of pacemaker (8) (9).

Experimentally in dogs atabrine has been shown to restore normal sinus rhythm in auricular fibrillation as effectively as quinidine (10). Atabrine was also effective in restoring normal sinus rhythm in supraventricular tachycardias (1) (11) (12).

The toxic actions of atabrine include liver intoxication (13), skin discoloration (14) (15), dermatitis (16) (17) (18), aplastic anemia (17), central nervous system damage (19) (20), psychoses (15) (21), and gastrointestinal disturbances (22). However, these adverse effects occur in only a small number of persons taking atabrine and are of short duration; the only prolonged disturbance is the dermatitis (16) (18). Electrocardiographic changes have occurred in only a few patients (8) (23). It has been suggested that intravenous atabrine was toxic to perfused rat's or rabbit's heart. However, such solutions are strongly acid ( $pH$  4.9), and solutions of the same  $pH$  not containing atabrine produced the same effect (24). Furthermore, the small volume of fluid injected (10 cc.) when diluted by blood would scarcely alter the  $pH$  of the blood.

Because of the possible toxic manifestations from prolonged use of atabrine, we limited the dosage of atabrine to a maximum of three separate intramuscular (gluteal) injections of 0.4 gm. each, dissolved in 10 cc. of 1 percent novocain solution (or 0.2 gm. intravenously in 10 cc. of normal saline), given every 6 hours (1) (11) (12). (Atabrine dihydrochloride is available in 0.2 gm. ampules.) With such methods relatively rapid high blood levels of atabrine are obtained. If normal sinus rhythm was restored prior to the second or third doses, the latter were omitted.

The following groups of patients were considered suitable candidates for atabrine therapy: (a) those with auricular fibrillation established less than 1 month regardless of associated valvular or non-valvular heart disease; (b) those with "established" auricular fibrillation in whom some indication for conversion to a sinus rhythm, such as embolism or chronic failure, existed; (c) auricular flutter; (d) paroxysmal tachycardias; and (e) ectopic rhythms associated

it was our plan to treat and overcome congestive heart failure before giving atabrine.

If three doses of parenteral atabrine failed it was our intention to use oral quinidine in the accepted manner. Atabrine is excreted slowly, requiring 2 to 3 weeks after its administration is discontinued: therefore, we did not consider using oral atabrine because of the possible cumulative toxic effects (21) (26). Quinidine is excreted rapidly.

Auricular fibrillation is converted to normal sinus rhythm, with the use of quinidine, in about 60 percent of the patients (27) and with atabrine in about 50 percent (1). In previous reports where treatment with quinidine failed to restore normal sinus rhythm, atabrine was also unsuccessful. However, in these reports instances of auricular fibrillation associated with hyperthyroidism in which restoration of normal rhythm would not be expected without surgical intervention were included (1) (11) (12).

#### CASE REPORTS

*Case 1*—A 36-year-old man with known rheumatic mitral valvular disease was admitted on 24 March 1949 because of dyspnea and vague joint pains. The physical findings were typical of mitral stenosis. Salicylates and bed rest were employed empirically although there was no evidence of rheumatic fever. After 3 weeks he was digitalized because of persistent dyspnea but his symptoms did not abate. One week later, while on maintenance doses of digitalis, he had auricular fibrillation. Three doses of atabrine (0.4 gm. each) were given intramuscularly 6 hours apart without effect. The following day quinidine (6 gr.) was given every 4 hours for 4 doses at which time the rhythm changed to a supraventricular tachycardia at a rate of 150. A few hours after this change he had chills and high fever which were assumed to be due to subacute bacterial endocarditis. Penicillin was given and the temperature became normal in 3 days. Attempts to stop the tachycardia by vagal stimulation were without effect. Quinidine, 6 gr. every 4 hours for 6 doses, was given without effect. Digitalis and quinidine were then discontinued, and 2 days later the rhythm changed to auricular fibrillation. Auricular fibrillation was still present 2½ months after onset, but, under sodium restriction, digitalis, and diuretics, compensation was maintained.

*Case 2*—A 52-year-old man with known mitral stenosis and auricular fibrillation for 7 years had required maintenance doses of digitalis. In the past 2 years he had several episodes of decompensation. He was admitted on 11 April 1949 with symptoms compatible with splenic embolism. While under observation he had an attack of flank pain and transient hematuria interpreted to be due to a renal infarct and shortly thereafter he had a left hemiplegia. An attempt to restore normal rhythm with three doses of atabrine (0.4 gm. each) intramuscularly at 6-hour intervals failed. Six doses of quinidine, 6 gr. every 4 hours, were also given without altering the auricular fibrillation.

*Case 3*—A 28-year old man was discharged from the Navy in 1945 because of an "enlarged heart." He was asymptomatic until August 1948 when he had auricular fibrillation. The rhythm was restored to normal with digitalization and quinidine, 6 gr. every 4 hours for 6 doses. Upon reducing the maintenance dose of quinidine from 3 gr. 3 times daily to 3 gr. once daily, he again had

auricular fibrillation. He was digitalized and quinidine was given as before. He remained asymptomatic for 8 months when he had a third paroxysm of fibrillation. He was readmitted on 29 April 1949 with auricular fibrillation and findings typical of mitral stenosis. There was no evidence of decompensation. He was given atabrine, 0.4 gm. intramuscularly at 6-hour intervals for 3 doses without effect. Subsequently, he was digitalized and the rate slowed from about 120 per minute to about 100 but the arrhythmia persisted. After digitalization atabrine, 0.4 gm., was given intramuscularly for 6 hours but without effect. Quinidine, 6 gr. every 4 hours, was then given orally. The rhythm changed to a sinus mechanism after the third dose of quinidine. Digitalis was discontinued and the patient was discharged. Maintenance doses of oral quinidine, 3 gr. 3 times daily, were prescribed.

*Case 4*—This 37-year-old man was admitted on 9 September 1949 complaining of allergic skin reaction following the local application of a sulfonamide. He had had uncomplicated scarlet fever in childhood. In July 1949 he had a 3-day attack of "congestion of the lungs" and was then told that his heart rhythm was irregular.

Physical examination revealed a generalized bullous urticarial eruption over the entire body except for the face, hands, and feet. The heart was enlarged to the left. A murmur typical of mitral stenosis and an irregular rhythm characteristic of auricular fibrillation was heard. The apical rate was 102 and the radial rate was 88.

After appropriate therapy he was digitalized on 16 September 1949 with oral digitoxin and the following day he was given three doses of atabrine dihydrochloride, 0.4 gm. intramuscularly in 1 percent procaine at 6-hour intervals. The fibrillation remain unchanged. The next day quinidine sulfate, 3 gr. every 4 hours, was given. This dose was ultimately increased to 9 gr. every 4 hours without effect on the fibrillation.

*Case 5*—A 54-year-old man was admitted on 15 March 1949 with right hemiplegia and aphasia. He had had hypertension for 3 years. At the time of admission the blood pressure was 145/100, the electrocardiogram showed left axis deviation with a left ventricular strain pattern and coronary insufficiency. On 16 April 1949 he was found to have a cardiac arrhythmia which both clinically and by electrocardiogram was auricular fibrillation. He was given atabrine, 0.4 gm. intramuscularly, at 6-hour intervals. The rhythm changed to a sinus mechanism 3 hours after the second dose. He was discharged, no further therapy was required.

*Case 6*—A 60-year-old white man was admitted on 21 April 1949. He complained of substernal distress of several hours duration. There was a long history of hospitalization because of cardiac disability. Examination revealed a blood pressure of 180/120 and a normal sinus rhythm. During examination he had generalized clonic convulsions, became cyanotic, and the pulse and blood pressure were imperceptible. An electrocardiogram (electrodes in place at the time of the convulsion) revealed first an auricular fibrillation and then a pattern interpreted as ventricular tachycardia. Atabrine, 0.2 gm. in 6 cc. of 1 percent procaine, was injected into the heart, followed in a few minutes by 10 cc. of 1 percent procaine. At the same time atabrine, 0.2 gm., was given intramuscularly. Within a few minutes the electrocardiogram pattern reverted to that of auricular fibrillation interrupted by runs of ventricular tachycardia, and the patient's general condition improved. Five hours later atabrine, 0.4 gm., was given intramuscularly and, about 3 hours later, the rhythm was noted to be

regular, confirmed by electrocardiogram. He remained in coma for 36 hours but made an uneventful recovery without any evidence of arrhythmia or signs of decompensation. Serial electrocardiograms failed to reveal any evidence of myocardial infarction. On 3 June 1949 he developed a fulminating bronchopneumonia and died within 48 hours. Autopsy showed no cardiac abnormality and no myocardial infarctions either fresh or old. The coronary arteries showed moderate arteriosclerosis but were not occluded.

*Case 7.*—A 79-year-old man was admitted on 23 April 1949 following pulmonary embolism secondary to phlebothrombosis. According to his physician an auricular flutter based on arterio-sclerotic heart disease had been present since the attack. This did not respond to adequate digitalization and small doses of quinidine. On admission he manifested slow auricular flutter (auricular rate 180, ventricular rate 60). Atabrine, 0.4 gm. intramuscularly, was given five times, twice on the day of admission at 6-hour intervals and three times the following day, without influencing the rhythm in any perceptible manner. Subsequently all cardiac drugs were discontinued for 1 week following which he was redigitalized with digitoxin. The arrhythmia was not changed. Six doses of quinidine, 6 gr. at 4-hour intervals, were then given and a sinus rhythm interrupted by occasional premature ventricular contractions occurred. The patient made a satisfactory recovery. Maintenance doses of digitoxin and quinidine were prescribed.

*Case 8.*—A 49-year-old white man was admitted on 11 May 1949 in mild shock with a diagnosis of massive anterior myocardial infarction. This was confirmed by electrocardiogram. During the third hospital day he lapsed into profound shock and had an absolute irregularity of the cardiac rhythm interpreted clinically as auricular fibrillation (electrocardiogram not obtained). In addition to blood transfusions and plasma, atabrine, 0.2 gm. in saline, was given intravenously. The rhythm became normal about 2 hours later and the blood pressure rose appreciably. About 8 hours after the restoration of normal rhythm the blood pressure again fell, and the rhythm was again irregular. Atabrine was administered intravenously as before but this time without effect. The patient died. At autopsy a recent massive anterior myocardial infarction was found.

*Case 9.*—A 53-year-old man was admitted on 27 June 1949 because of sudden onset of angina, weakness, faintness, and palpitation in the chest 6 hours previously. An electrocardiogram showed auricular fibrillation. Two doses of atabrine, 0.4 gm. in 10 cc. of 1-percent procaine, were given 6 hours apart without effect on the fibrillation. About 48 hours after admission (36 hours after atabrine) the rhythm spontaneously became normal. Subsequent electrocardiograms revealed changes suggestive of coronary insufficiency, but no infarction pattern appeared on serial tracings.

*Case 10.*—This 58-year-old man was admitted to the hospital on 11 August 1949 complaining of "high blood pressure" for 15 years, dyspnea and ankle edema for 8 months, and weakness of the left side for 1 month. He had been taking digitals. There was no clear indication as to the time of onset of fibrillation.

Physical examination revealed a dyspneic man whose blood pressure was 250/140; pulse, 50; and apical rate, 72. The cardiac rhythm was irregular; the heart was enlarged to the left; and no murmurs were detected. There was a partial left hemiparesis. An electrocardiogram showed auricular fibrillation.

Digitals and other medications including physical therapy were prescribed. The blood pressure remained 200/120.



Six weeks after admission he had several attacks of nocturnal paroxysmal dyspnea. After a satisfactory prothrombin level had been obtained with dicumarol, on 6 October 1949 he was given three intramuscular doses of atabrine, 0.4 gm in 1 percent procaine at 6-hour intervals, without effect on his cardiac rhythm. The next day he was given quinidine sulfate, 3 gr every 2 hours for eight doses, without effect on the fibrillation. Quinidine was then discontinued because of nausea.

His course after this was downhill and he died on 20 October 1949.

**Case 11**—A 52-year-old white man was admitted on 12 September 1949 complaining of dyspnea on exertion, paroxysmal nocturnal dyspnea, orthopnea, and sub-sternal pain radiating to the right of the sternum for 3 months, palpitation for 6 weeks, and ankle edema for 3 days. There had been no previous cardiac complaints.

The patient was a moderately obese and dyspneic white man with dullness and absent breath sounds at both bases of the lungs. The heart was enlarged 2 cm to the left of the midclavicular line in the sixth intercostal space. There was an irregular rhythm with an apical rate of 110 and a pulse rate of 92. The blood pressure was 180/100. The liver was palpable 6 fingerbreadths below the right costal margin and was quite tender. There was a moderate edema of the ankles. He was treated by digitalization and maintenance doses of digitoxin, mercurial diuretics, ammonium chloride and a salt-poor diet. By 21 September 1949 he no longer showed signs of failure but he still had auricular fibrillation. On that date he was given three doses of atabrine, 0.4 gm intramuscularly in 1 percent procaine at 6-hour intervals. Twenty-four hours later his rhythm was still irregular. On 22 September 1949 quinidine sulfate, 3 gr every 4 hours was given. After 2 days, normal sinus rhythm occurred. He was discharged 1 week later. Maintenance doses of digitoxin and quinidine, 3 gr three times daily, was prescribed.

**Case 12**—A 2½-year-old girl had attacks of supraventricular tachycardia since the age of 7 months. There was no evidence of organic heart disease. Each episode was successfully treated by digitalization. Atabrine, 0.1 gm intramuscularly, was given twice 4 hours apart during the seventeenth and eighteenth attacks. Both times the pulse gradually slowed to normal during the 3 hours after the second injection. Review of the history shows that similar response was noted following digitalis therapy previously and that the attacks lasted from 12 to 24 hours no matter what therapy was employed.

A subsequent attack of tachycardia again became normal 1 hour after a second dose of atabrine, 0.1 gm, was given intramuscularly.

**Case 13**—A 27-year-old woman was admitted on 1 May 1949 because of chest pain, dyspnea and tachycardia. She was emotionally unstable and this had been apparent to previously consulted physicians. (Her husband had recently died of mitral stenosis (auricular fibrillation).) An electrocardiogram revealed a nodal tachycardia, rate 140. Atabrine, 0.3 gm (patient's weight was 110 pounds) was given intramuscularly. The rhythm suddenly became normal 3½ hours later and her symptoms immediately subsided.

**Case 14**—A 52-year-old man was admitted on 12 September 1949 complaining of dyspnea, orthopnea, nausea, desire to defecate, palpitation, and heartburn. All symptoms had appeared suddenly 2½ days previously. He had had no previous history of cardiac or gastrointestinal complaints. He had a tachycardia, rate 200, with the rhythm slightly irregular, the blood pressure was 150/90, but there were no signs of congestive failure. An electrocardiogram revealed

a nodal tachycardia, rate 180. That day he was given three injections of atabrine, 0.4 gm. in 1 percent procaine, intramuscularly, at 6-hour intervals. The rate slowed to 140. Two hours after the last dose of atabrine he was given 1.2 mg. of digitoxin by mouth and quinidine sulfate, 6 gr. every 4 hours. Eight hours later his rhythm became and remained normal. There was no evidence of myocardial infarction, and the patient was discharged on 17 October 1949. Maintenance digitoxin and quinidine sulfate were prescribed.

*Case 15.*—A 65-year-old white man was admitted 25 October 1949 complaining of severe dyspnea of 2 days' duration. Previously he had had dyspnea on exertion for 2 years. He had no chest pain.

On physical examination the patient was orthopneic and cyanotic and the neck veins were distended. Bilateral râles and wheezes were heard at both lung bases; the heart was enlarged to the left of the midclavicular line; and the rhythm was rapid and regular at 180. The liver was tender and palpable 4 cm. from the right costal margin. There was no ankle edema.

An electrocardiogram revealed a supraventricular tachycardia, rate 180. Attention was first directed to the congestive failure. He was digitalized with intravenous cedilanid, given oxygen, morphine, and atropine every 4 hours, aminophylline intravenously and by mouth, and a "bloodless phlebotomy" by rotation of tourniquets. The next morning (26 October 1949) he had less dyspnea, the chest was clearer, but the tachycardia persisted (rate 178). That day he was given 4 doses of atabrine, 0.4 gm. intramuscularly every 6 hours. On 27 October 1949 the electrocardiogram showed a mixed auricular flutter-fibrillation. Quinidine, 3 gr. every 4 hours, was given and after 24 hours electrocardiogram showed a rate of 140 and a nodal tachycardia. The dose of quinidine was increased to 6 gr. every 4 hours and a day later, on 29 October 1949, the electrocardiogram showed auricular fibrillation.

After another 6 doses of quinidine, 6 gr. every 4 hours, the rhythm was found to be normal with a rate of 94. Since that time the rhythm has been regular. Maintenance doses of digitoxin and quinidine, 3 gr. 4 times daily, were continued.

#### COMMENT

Atabrine parenterally is of no more value than oral quinidine in restoring auricular fibrillation associated with mitral stenosis to normal rhythm in either acute or chronic cases. In one patient with acute fibrillation, quinidine was successful three times; whereas, atabrine on the one occasion it was used was of no avail.

In the arteriosclerotic and hypertensive group, in three patients with acute auricular fibrillation normal rhythm was restored by atabrine. One patient probably had ventricular fibrillation in addition. The result here is clouded by the fact that procaine was given intracardially and intravenously at the same time. In one patient in whom normal rhythm was restored by atabrine, death occurred 8 hours later from resumption of fibrillation. This might have been prevented by administering oral quinidine after normal rhythm was established.

No patient with hypertensive and arteriosclerotic heart disease with chronic arrhythmias was benefited by the use of atabrine. However, the patients with auricular flutter and auricular fibrillation were converted by quinidine. From this small series it appears that atabrine is not as efficacious as quinidine.

In auricular fibrillation associated with nonvalvular heart disease, especially that of short duration, normal rhythm was restored in five out of seven patients (71.4 percent) while in fibrillation associated with valvular disease normal rhythm occurred in one out of four (25 percent).

Atabrine or quinidine restored normal rhythm in all four patients with tachycardia. Two of these were of the type (supraventricular) in which normal rhythm may return spontaneously. In two patients the accompanying coronary arteriosclerosis was evidenced by signs of congestive failure. Atabrine failed to restore normal sinus rhythm, but after administering quinidine for from 48 to 72 hours normal rhythm occurred. In our series of 15 cases normal rhythm was restored with atabrine in 5, with quinidine in 5, and 5 were failures, giving a total conversion rate of 66 percent. In previous reports (1) (27) normal rhythm was restored in 60 percent with quinidine and in 50 percent with atabrine. It is realized that the number of cases is statistically too small to draw significant conclusions. However, the results suggest that with the use of both drugs in the future, perhaps a slightly higher percentage of cases might be converted.

If the patients with tachycardia are excluded from the results it may be seen that in 54.6 percent of patients with auricular fibrillation, including one of auricular flutter, normal rhythm is restored by the use of either atabrine or quinidine. This figure compares favorably with those previously reported (1) (27).

#### SUMMARY

Atabrine's value appears to lie in the treatment of auricular fibrillation of short duration associated with nonvalvular heart disease. It was of no more value than quinidine in patients with chronic fibrillation either with or without valvular disease and is of questionable value in the treatment of supraventricular tachycardia.

In our series restoration of normal rhythm with the use of atabrine or quinidine was successful in 66 percent of patients with arrhythmias.

#### REFERENCES

1. GERTLER, M. M., and YONAHLE, S. B. Effect of atabrine (quinacrine hydrochloride) on cardiac arrhythmias. *Am Heart J* 37: 79, Jan 1949.
2. WEALSH, and HACHMANSON: On toxicity of atabrine (quinacrine). *Proc Soc Exper Biol & Med* 54: 336, 1939.
3. BARKIN, B. P., and MELVILLE, K. I. Effect of quinine and atabrine on parasympathetic innervation of heart and on coronary circulation. *Canad M A J* 54: 69, 1946.
4. BARKIN, B. P., and KARP, D. Effect of quinine and atabrine on gastric secretion, preliminary communication. *Canad M A J* 56: 137-141, Feb 1947.

5. SUFFOLK AND BERKSHIRE, EARL OF (Charles Henry George Howard): Pharmacological actions of auridine derivatives with special reference to those of acriflavine and atabrine. *Quart. J. Exper. Physiol* 29: 1-11, March 1939
6. HECHT, G.: Pharmakologisches über Atebrin. *Arch. f. exper. Path. u. Pharmacol* 170: 328-338, 1933
7. BABKIN, B. P., and RITCHIE, T. W.: Effect of quinine on parasympathetic innervation of heart in dog. *Rev. canad. de biol.* 4: 346-368, 1945
8. LEVINE, H. D., and ERLANGER, H.: Atabrine and electrocardiogram. *Am. J. M. Sc.* 212: 538-540, Nov. 1946
9. LEWIS, T.; DEURY, A. N.; ILIESCU, C. C.; and WEDD: Action of quinidine upon dog's heart with special reference to its action on clinical fibrillation of auricles. *Heart* 9: 55-85, Dec. 1921
10. GERTLER, M. M., and KARP, D.: Effect of atabrine on auricular fibrillation in dog. *Proc. Soc. Exper. Biol. & Med.* 64: 213-218, Feb. 1947
11. GERTLER, M. M., and YONHALEM, S. B.: Effect of atabrine on auricular fibrillation and supraventricular tachycardia in man. *J. Mt. Sinai Hosp* 13: 323-327, Mar.-Apr. 1947.
12. GERTLER, M. M., and YONHALEM, S. B.: Effect of atabrine on auricular fibrillation in man. *Canad. M.A.J.* 47: 249-253, Sept. 1947
13. MUSSEY, J. H.: *Internal Medicine: Its Therapy and Practice*. 4th edition. Lea and Febiger, Philadelphia, Pa., 1945. p. 1518.
14. LEVINGOOD, C. S., and DIEUAIDE, F. R.: Untoward reactions attributable to atabrine. *J. A. M. A.* 129: 1091-1093, Dec. 15, 1945
15. Armored Medical Research Laboratory, Ft. Knox, Ky.: Project 18. Investigation of the Effects of Activity and Environment on Atabrine Therapy. Dec. 23, 1943.
16. ALDEN, H. S., and FRANK, L. J.: Atypical lichenoid dermatitis—drug eruption due to quinacrine hydrochloride (atabrine). *Arch. Dermat. & Syph.* 56: 13-29, July 1947.
17. DRAKE, J. R., and MOON, H. D.: Atabrine dermatitis and associated aplastic anemia. *California Med.* 65: 154-156, Oct. 1946
18. NABBET, T. W.: Dermatitis due to quinacrine hydrochloride (atabrine). *J. A. M. A.* 134: 446-450, May 31, 1947
19. NEWELL, H. W., and LIMB, T.: Toxicity of atabrine to central nervous system. *Am. J. Psychiat.* 102: 807-818, May 1946
20. SIFFEL, H., and MUSHETT, C. W.: Structural changes following administration of quinacrine hydrochloride. *Arch. Path.* 38: 63-70, Aug. 1944
21. GREHNER: Psychoses associated with administration of atabrine. *Am. J. Psychiat.* 101: 306, Nov. 1947.
22. GOLDNER, J. L., and BERGER, M.: Experience with atabrine aboard troop transport. *U. S. Nav. M. Bull.* 46: 895-897, June 1946
23. HIMMANN, H. L., and SHAPIRO, B. G.: Effects of plasmoquin, atabrine, and quinine on electrocardiogram. *Brit. Heart J.* 5: 131-133, July 1943
24. GERTLER, M. M., HOFF, H. E.; and HUMM, D. G.: Acid tolerance of dog heart. *Am. J. Physiol.* 146: 478-486, June 1946.
25. NARUM, and HOFF: Production of auricular fibrillation by application of acetyl-B-methyl choline to localized regions of auricular surface. *Proc. Am. Physiol. Soc.* 129: 428, May 1940
26. GOODMAN, L., and GILMAN, A.: *The Pharmacological Basis of Therapeutics*. The Macmillan Co., New York, N. Y., 1941. pp. 918-921.

27. STROUD. Significant treatment of auricular fibrillation. Internat Clin Vol I 45th Series. J B Lippincott Co, Philadelphia, Pa., 1939
28. BOWER, A G. Untoward effects of atabrine. California Med 65: 177, Oct 1946
29. GERTLER, M M and KARP D. Effect of atabrine (quinacrine, acridine dye) on para-sympathetic innervation of dog heart in situ. Rev canad de biol 6: 229-244, 1947
30. HARVEY, A M. Actions of quinine on skeletal muscle. J Physiol 95: 47-67 Feb 14, 1939
31. LEWIS, T. Action of certain drugs upon fibrillation of auricles. Heart 9 207-267, Apr 1922
32. SMITH L. H. (Boston), and STOCKLE, J D. Effect of quinacrine hydrochloride (atabrine) on isolated mammalian heart. Proc Soc Exper Biol & Med 62: 179-184, June 1946.
33. SOLLMAN, T. A Manual of Pharmacology and Its Applications to Therapeutics and Toxicology 6th edition W B Saunders Co, Philadelphia, Pa., 1942 pp 697-608



SONIC VIBRATED LEPTOSPIRAE AS ANTIGENS IN THE COMPLEMENT FIXATION TEST FOR THE DIAGNOSIS OF LEPTOSPIROSIS, by Raymond Randall, Colonel, VC, U. S. A., Psyche W Wetmore, and Albert R. Warner, Jr. Journal of Laboratory and Clinical Medicine 34: 1411-1415, Oct. 1949

Because a simple and reliable diagnostic test for leptospirosis was not available, a study was undertaken to develop an antigen for use in a complement fixation test that could be performed in any laboratory conducting the Wassermann or similar complement-fixation tests. Since antigens prepared by the usual methods gave unsatisfactory results, experiments were undertaken to produce a suitable antigen, and it was found that leptospirae ruptured by sonic vibration yielded an antigen of considerable specificity and sensitivity. Serums from patients with leptospirosis caused by *Leptospira icterohaemorrhagiae* and *Lept grippotyphosa* reacted with *Lept canicola* and *Lept icterohaemorrhagiae* antigens to titers regarded as specific for leptospirosis.—Abstract



# Assay of Gonadotropins in the Diagnosis of Neoplasms

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**D**ETERMINATION of the excretion of gonadotropins in the urine is of value in diagnosing neoplasms arising from the testes and the chorionic villi. Normally, the anterior lobe of the pituitary stimulates the ovaries and testes by means of specific gonadotropins that are believed to be secreted by the basophilic cells of this gland. One of these substances is known as follicle stimulating hormone (FSH) or prolan A. This substance, in women, stimulates the growth and maturation of ovarian follicles, and in the presence of a small amount of luteinizing hormone results in estrogen production and ovulation. In men this hormone stimulates the cells of the seminiferous tubules and produces spermatogenesis. Another gonadotropin which is secreted by the pituitary is the interstitial cell stimulating hormone, luteinizing hormone, or prolan B. This substance stimulates the interstitial cells of the ovary in some animals and in human beings stimulates the granulosa cells to undergo luteinization and form the corpus luteum after they have been under the influence of FSH. In male animals it stimulates the interstitial cells of Leydig to produce the male sex hormone. This hormone can also stimulate the seminiferous tubules indirectly, since it stimulates the Leydig cells, which, in turn, release testosterone. Thus, at least in small doses, seems to promote spermatogenesis. A third hormone of the pituitary, the lactogenic hormone, is capable of inducing and maintaining lactation in the breasts of animals with intact pituitary glands. It also prolongs the life of the corpus luteum. The chorionic trophoblastic cells of the human placenta also produce a gonadotropin. It has a luteinizing action, and, consequently, is frequently referred to as "anterior pituitarylike hormone." Normally, in pregnant animals, its function seems to be stimulation of the luteal cells in order that they keep functioning until the placental tissue starts the formation and secretion of progesterone. In contrast to the pituitary luteinizing hormone, however, it possesses no important stimulating action on the

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ovaries in human beings other than prolongation of the presence of the corpus luteum. In male animals it brings about testicular descent in cryptorchism and is capable of stimulating the interstitial tissue with a resultant outpouring of androgens. Equine gonadotropin is produced by the placenta of the pregnant mare and is present in the blood of this animal during pregnancy. It is unique in that it is not excreted in the urine of the pregnant mare and also in that it has both follicle-stimulating and luteinizing properties.

All of these substances are complex glycoproteins that vary in their isoelectric points, in their molecular weights, and in the composition of the active carbohydrate and amino nitrogen groups. All are soluble in water and may be precipitated by alcohol, benzoic acid, or tannic acid, a property that allows their concentration and partial purification in the quantitative Aschheim Zondek test. Their potency is lost slowly on standing in solution, and is destroyed readily by heating, or by excess acid or base.

The tests for gonadotropins in urine or blood can be divided into qualitative tests for the diagnosis of pregnancy, and quantitative tests that determine the excretion of gonadotropins in the urine in 24 hours. The pregnancy tests vary not only with the animals used, but also with the time required to carry out the determination. In the Aschheim-Zondek test, immature female mice or rats are usually used. While 96 hours are needed for the completion of this test, only 48 hours are needed for the Friedman test, which uses mature female rabbits that have been isolated for 3 weeks. Several pregnancy tests requiring less than 24 hours for their completion are available. One such test depends on the hyperemia of the ovaries produced in the immature rat by the injection of urine containing chorionic gonadotropin; the optimum time for reading the reaction varies from 2 to 24 hours according to various investigators. Another group of rapid pregnancy tests uses various species of frogs and toads. The South African clawed toad (*Xenopus laevis*) reacts to the injection of urine from a pregnant woman by the extrusion of grossly visible ova, usually within 24 hours, while the male South American toad (*Bufo arenarum*) and the male North American frog (*Rana pipiens*) react to chorionic gonadotropin by the release of spermatozoa, usually within 2 hours. These can be easily seen by microscopic examination of the cloacal fluid.

The only test which has been consistently used for quantitative assay of gonadotropins is the quantitative Aschheim-Zondek test. The Fourth Army Medical Laboratory uses the quantitative Aschheim-Zondek test as modified by Cutler and Owen (1) and by Vermooten and Hettler (2). The gonadotropins are concentrated by precipitation from aliquots of a 24-hour specimen of urine by adding 5 vol-

umes of 95 percent ethyl alcohol and allowing the mixture to stand overnight at 4° C. The precipitated glycoproteins are next washed with ether, dried, and put into solution by dissolving them in 8 cc. of distilled water, giving either a fivefold or tenfold concentrate, depending on whether 40 cc. or 80 cc. of urine was used. The concentrate is injected subcutaneously into immature female mice, weighing 8 to 10 gm., in 5 doses, 2 on the first day, 2 on the second day, and 1 on the third day. One mouse is given a total of 0.5 cc. of the fivefold concentrate which equals 2.5 cc. of urine while others receive an equivalent of 5, 10, and 20 cc. of urine. The last is injected with the tenfold concentrate. The mice are killed with chloroform 48 hours after the last injection and are examined for enlargement of the uterus and/or formation of either hemorrhagic follicles or corpora lutea.

The mouse unit (M. U.) with which the gonadotropins are measured equals the smallest dose of urine expressed in milliliters that produces unmistakable enlargement, usually with hyperemia of the bifurcated uterus, and/or hemorrhagic follicle or corpus luteum formation. One thousand divided by this unit equals the M. U. per liter. Since it takes about five times as much gonadotropin to cause ovulation as it does to induce secondary estrus with enlargement of the uterus and opening of the vaginal orifice, the mouse units giving an enlarged uterus are multiplied by five if the ovaries show either corpora hemorrhagica or corpora lutea (2). The amount of the gonadotropins needed to form corpora hemorrhagica or corpora lutea is influenced by the ratio of FSH and chorionic gonadotropin present in the urine as well as possible activity of the test animal's pituitary. Nevertheless it has been the experience of the writer that the fivefold relationship is usually present. The technique and reading of the quantitative tests are summarized in table 1. The 50 and 100 M. U. assays are run in duplicate since these mice receive the more concentrated solutions, and consequently are more prone to die. If all of the mice tested show positive findings, the assay can be carried even farther by the use of undiluted and diluted urine (table 2).

TABLE 1

Test mouse	Schedule of injections					Total dose in milliliters	Equivalent quantity of urine in milliliters	M. U./L. required to produce positive	
	A M	P M	A M.	P. M	A M			Uterine findings	Ovarian findings
1	0.1	0.1	0.1	0.1	0.1	0.5	2.5	400	2,000
2	.2	.2	.2	.2	.2	1.0	5.0	200	1,000
3	.4	.4	.4	.4	.4	2.0	10.0	100	500
4	.4	.4	.4	.4	.4	2.0	10.0	100	500
5	.4	.4	.4	.4	.4	2.0	20.0	50	250
6	.4	.4	.4	.4	.4	2.0	20.0	50	250



TABLE 2

Test mouse	Total amount of urine given in 5 injections	M U/L required to produce positive	
		Uterine findings	Ovarian findings
1	2 ml of undiluted urine	500	2,500
2	1 ml of undiluted urine	1,000	5,000
3	2 ml of urine diluted 1/10	5,000	25,000
4	1 ml of urine diluted 1/10	10,000	50,000
5	2 ml of urine diluted 1/100	50,000	250,000
6	1 ml of urine diluted 1/100	100,000	500,000

The amount of the gonadotropin excreted in the urine of normal persons is important if this assay is to be used for diagnostic purposes. Gonadotropins do not appear in the urine until about a year before the onset of menstruation in girls, and in boys a positive response cannot be obtained before the age of 12 or 13 years (3). The normal values obtained in adults vary somewhat with different methods of concentration of gonadotropins in the quantitative Aschheim-Zondek test and also the endpoints used. The levels presented here are those obtained by this laboratory and other laboratories using similar techniques (4) (5) (6), and refer to gonadotropins arising from the pituitary gland.

The normal menstruating woman excretes up to 100 M U in 24 hours usually with a peak of excretion near the middle of the cycle which is probably related to ovulation, while the castrated or post-menopausal women will excrete up to 500 M U. of gonadotropins in 24 hours. Here the pituitary gland attempts to stimulate an organ that is either no longer present or nonfunctional, thereby increasing the amount of FSH formed for a period varying from 6 months to 30 years (3). On the other hand, the normal man excretes less than 50 M U in 24 hours. In some hypogonadic or castrated men the excretion is slightly elevated, but never as high or as constant as in post-menopausal women.

The group of neoplasms with which quantitative studies of gonadotropin are most frequently used as an aid in diagnosis in the Army, are the testicular tumors (seminoma, teratoma, embryonal carcinoma, teratocarcinoma, and chorio-epithelioma). This group of tumors according to Friedman and Moore (7) probably arises from embryonic germ cells, with the seminoma coming from primordial germ cells and being composed of mononuclear growths. On the other hand, teratoid tumors and embryonal carcinomas which, according to these workers, include the chorio-epitheliomas, probably arise from more primitive embryonic germ cells which have the capacity to form both somatic and trophoblastic tissue. Occasionally seminomas will metastasize with formation of trophoblastic tissue, indicating that there must be primitive embryonic cells present in these tumors at times. Patients

with testicular tumors may excrete an abnormal amount of the gonadotropins in the urine and their urine will occasionally give a positive test for pregnancy. Ferguson (8) attempted to correlate the type of neoplasm found with the amount of the gonadotropins formed and proposed a classification of these tumors which was based on the amount of the gonadotropins in the urine. He believed that the larger the amount of this hormone excreted, the more embryonal the tumor as well as the larger the mass of viable tissue present. Ferguson also believed that the embryonal tumor, as it grew, produced an unidentified substance or hormone which stimulated the anterior lobe of the pituitary to secrete an increase of FSH.

It appears, however, that the pituitary gland does not enter into this process, but that the embryonic tumor itself forms the gonadotropins since the tumor tissue can be shown to have a high concentration of the active material if there is excretion of these substances before removal of the neoplasm (9). The presence of abnormal amounts of gonadotropins in the urine is not related so much to the structure of the tumor as to whether there is chorionic tissue present either in the primary tumor or in the metastases. Furthermore, Ferguson's belief that the quantitative test is a reliable means of differentiating types of testicular tumors is no longer accepted. Cahill (10) stated that the amount of the gonadotropins present with these tumors is an index of the amount and activity of syncytial secreting cells (presumably syncytiotrophoblasts). On the other hand, Stewart and his co-workers (11) reported that tissue cultures of placental tissue show a direct correlation between the growth of cytotrophoblasts and the production of gonadotropins. They were unable, however, to grow the syncytial cells well enough so that they could determine which, if any hormones, were elaborated by these cells. Further evidence that the cytotrophoblast is instrumental in the elaboration of gonadotropin, is the observation that at about the middle of pregnancy, when normally the excretion of gonadotropins is decreasing, the layer of cytotrophoblasts disappears in the placental villi (12). Whether it is only one or both of these cells which secrete gonadotropin is not clear.

Although focal chorio-epitheliomas are rarely observed in seminomas, about 4 percent of the 922 tumors studied by Friedman and Moore (7) contained both seminomatous and embryonal carcinomatous tissue. Even though the tumor is primarily a seminoma, the metastases may be embryonal carcinoma with active secretion of gonadotropin. An example is the following case.

#### CASE REPORT

A 33 year-old man first noted a hard painless nodule on one testis in March 1947. An assay of urinary gonadotropins revealed less than 100 M. U. per

liter of urine at this time but 1 month later revealed 200 M U. per liter. Several examinations revealed 100 M U per liter. A unilateral orchiectomy was performed and the pathologic diagnosis was seminoma without extension into the cord vessels. About 2 months later, 2,000 M U of gonadotropin per liter of urine was found, and high voltage roentgen therapy was started. In November, an intravenous pyelogram revealed a deviation of one ureter, which was thought to be caused by a retroperitoneal mass. The excretion of gonadotropins at this time varied from 2,000 to 5,000 M U per liter. A retroperitoneal lymph node was resected and the microscopic examination revealed an undifferentiated carcinoma.

The patient died after a rather long and stormy illness. An assay of gonadotropins several months before death showed more than 10,000 M U excreted in the urine in 24 hours. Unfortunately, the exact level was never determined.

The autopsy showed multiple visceral and pulmonary metastases while the microscopic examination showed this to be an embryonal carcinoma with some of the characteristics of a seminoma.

In contrast a 26-year-old soldier whose primary tumor was an embryonal carcinoma had widespread metastases before death and only embryonal carcinoma was found. The highest titer of gonadotropins obtained in this case was 150 M U in 24 hours.

Friedman and Moore (7) stated that in their series of 922 testicular tumors some embryonal carcinomas had a striking morphologic resemblance to the cytotrophoblastic cells of chorio-epitheliomas. This may explain the elaboration of gonadotropins by tumors that are considered embryonal carcinomas and not chorio-epitheliomas. It is possible that these cells are so anaplastic that they have lost their power to elaborate this hormone. Another factor which is not always appreciated is that in any pathologic examination only a few blocks of tissue are taken from a tumor or its metastases for study, and chorionic tissue may not be present in the blocks chosen (13).

The hormone produced by the malignant tissue is chorionic in type (14) (15). The fact that about 12 percent of these malignant tumors arise in undescended testes may be confusing and many of these patients probably represent hypogonadal states in which the pituitary is attempting to stimulate these organs by an increase in the FSH produced (15) (16). Either unilateral castration or destruction of a testis by the tumor may decrease the amount of androgens secreted in the body with a resultant increase, usually slight in the amount of the gonadotropins in the 24-hour urine specimen (2). This is caused by an increase in the FSH elaborated by the pituitary. Postoperative high voltage roentgen therapy to the genital area may be the factor in this castration effect, but the roentgen rays primarily affect the seminiferous tubules and have relatively little effect on the Leydig cells which secrete the androgens (17). The differentiation of pituitary gonadotropin (FSH) and chorionic gonadotropin involves the use of either hypophysectomized female rats which give only luteinization of thecal cells when stimulated with chorionic gonadotropin or the destruction

of the FSH by extraction of the chorionic gonadotropin with tricesol. Careful examination of the amount of the gonadotropins needed to increase the weight of the ovaries of infantile rats may also be used since small amounts of FSH will give a maximum weight increase rapidly in contrast to the slower action of large doses of chorionic gonadotropin (15). One can readily see that the differentiation of these two hormones in the ordinary laboratory is impractical.

The fact that there is abnormal excretion of gonadotropins as assayed by the usual methods in a patient with a testicular tumor is of little use in determining whether metastases have occurred preoperatively. If, however, a high value is obtained, one can usually assume that trophoblastic tissue is present. After the primary tumor has been removed, persistent high abnormal excretion of gonadotropins or a rise after an initial fall in titer is evidence that secretory metastatic cells are present elsewhere in the body. Usually quantitative assays of gonadotropins are determined postoperatively every month for at least 3 months with a gradual lengthening of the intervals for the next 3 to 5 years.

The assay of excreted gonadotropins is also of aid in the diagnosis of both hydatid moles and chorio-epitheliomas in women. Both are derived from chorionic tissue and, as such, they elaborate varying amounts of the gonadotropins. Normally, about 4 weeks after conception the amount of the gonadotropins in the urine increases and steadily rises to a peak between the sixth and twelfth weeks of gestation. The excretion of gonadotropins then drops rapidly to a much lower level during the remainder of pregnancy. After the delivery of the placenta, the level of gonadotropins falls rapidly, and within a week usually reach levels observed in nonpregnant women. Whereas, in a normal pregnancy the peak of excretion of gonadotropins is reached in the first trimester, in hydatid degeneration of the placenta, there is usually a larger excretion of gonadotropins in the third to fifth month of pregnancy (i. e. from 200,000 to several million M. U. in 24 hours) when normally the titer of gonadotropins is decreasing (18). The excretion of gonadotropins appears to be roughly proportional to the amount of trophoblastic tissue present. By means of tissue culture, Jones, Gey, and Gey (19) showed that tissue from both ectopic pregnancies and hydatidiform moles produces gonadotropins for periods of 2 to 6 months. In general, if a malignant chorio-epithelioma occurs, the excretion of gonadotropins is even higher than in a patient with a hydatid mole. Significance is placed on the detection of gonadotropins in the spinal fluid in patients with hydatid mole and chorio-epithelioma, which is said never to occur in a normal pregnancy (18). Several cases of normal pregnancy have been recorded in which it was possible to obtain a positive Aschheim-Zondek test (20). Hydatidiform moles and chorio-epi-

thelomas have also been known, on rare occasions, to elaborate virtually no gonadotropins (21). The excretion of gonadotropin is not only influenced by the amount of chorionic tissue present but also by its proximity to blood supply and the capacity of the cells present to elaborate this hormone. It may be that the absence of this capacity is an index of the degree of anaplasia of the tumor cells. Novak stated that both cytotrophoblasts and syncytial trophoblasts participate in the malignant process of a chorio-epithelioma, but that it is commonly believed that tumors showing a predominance of syncytial elements are less malignant than those in which the cytotrophoblasts predominate (12).

The usual procedure after the passage of a hydatid mole, is to obtain periodic 24-hour quantitative assays of gonadotropins in order to detect either residual chorionic tissue or the development of a chorio-epithelioma. Levels of detectable gonadotropin may, however, persist for 4 to 12 weeks after successful passage of a hydatid mole, since the time required for these levels to disappear depends on the original height of the blood level and the rate of excretion.

Each patient who has passed a hydatid mole should be followed by quantitative studies of gonadotropins every 2 to 4 weeks for the first 6 months, every 2 or 3 months in the second 6 months, and at least twice a year thereafter for several years. Since a single determination is of limited value, it is important to determine whether the hormone is increasing or decreasing. No matter how long after removal of the tumor, falling levels can only mean that no new hormone has been produced and that there is no functioning chorionic tissue left. Any rise in level indicates either recurrence of the tumor, the development of malignancy, or another pregnancy.

Since gonadotropins are produced by the basophilic cells of the pituitary in the normal person, one would expect excessive amounts of these hormones in cases of pituitary basophilic tumors which may be the cause for some cases of Cushing's syndrome. This occurs only sporadically, if at all, and relatively early in the course of the disease (3). Consequently, the value of the assay for these substances is practically nil in this pathologic entity.

#### CONCLUSIONS

The quantitative determination of the excretion of gonadotropins in the urine is of aid in the diagnosis of neoplasms arising from the testes and from the chorionic villi. Because of the variation encountered, this assay should be used only as confirmatory evidence in the diagnosis of these neoplasms and should not be regarded as a necessary diagnostic criterion. The quantitative assay of gonadotropins is also of aid in the detection of metastases or recurrence of these tumors.

## REFERENCES

1. CUTLER, M., and OWEN, S. E.: Clinical value of prolan A determinations in teratoma testis. *Am J Cancer* 24: 318-325, June 1935.
2. VERMOOTEN, V., and HETTLER, W. F.: Significance of gonadotropic hormones in urine of patients with testicular tumors. *J. Urol.* 60: 519-523, Sept. 1948.
3. CANTAROW, A., and TRUMPER, M.: *Clinical Biochemistry* 3d edition. W. B. Saunders Co., Philadelphia, Pa., 1945. p. 530
4. WERNER, S. C.: Quantitative study of urinary excretion of hypophyseal gonadotropin, estrogen, and androgen of normal women. *J. Clin Investigation* 20: 21-30, Jan 1941
5. WERNER, S. C.: Quantitative study of urinary excretion of hypophyseal gonadotropin, estrogen, and neutral 17-ketosteroids of normal men. *J. Clin. Investigation* 22: 395-401, May 1943.
6. KLINFFELTER, H. F., JR.; ALBRIGHT, F.; and GRISWOLD, G. C.: Experience with quantitative test for normal or decreased amounts of follicle stimulating hormone in urine in endocrinological diagnosis. *J Clin Endocrinol.* 3: 529-544, Oct. 1943.
7. FRIEDMAN, N. B., and MOORE, R. A.: Tumors of testis. *Mil. Surgeon* 99: 573-593, Nov. 1946.
8. FERGUSON, R. S.: Pathologic physiology of teratoma testis. *J A M A* 101: 1933-1937, Dec 16, 1933
9. MOUTON, F. R.: *The Chemistry and Physiology of Hormones* American Association for the Advancement of Science, Washington, D. C., 1944 p. 165.
10. CAHILL, G. F.: Cancer of adrenals and testes. *J. A. M. A.* 138: 415-425, Oct 9, 1948.
11. STEWART, H. L., JR.; SANO, M. E.; and MONTGOMERY, T. L.: Hormone secretion by human placenta grown in tissue culture. *J. Clin. Endocrinol.* 8: 175-188, Feb. 1948
12. NOVAK, E.: *Gynecological and Obstetrical Pathology.* 2d edition. W. B. Saunders Co., Philadelphia, Pa., 1947 p. 485.
13. BREWER, J. I.: Chorionic gonadotropin in diagnosis of testicular tumors. *Arch. Path.* 41: 580-591, June 1946
14. FYVOLD, H. L.; FISKE, V. M.; and NATHANSON, I. T.: Physiological reactions produced by gonadotropic hormone from urine of case of chorioepithelioma. *Endocrinology* 24: 578-580, April 1939
15. TWOMBLY, G. H.: Relationship of hormones to testicular tumors. *Surgery* 16: 181-193, Aug 1944
16. GORDON-TAYLOR, G., and WYNDHAM, N. R.: On malignant tumors of testicle. *Brit. J Surg.* 35: 6-17, July 1947.
17. SLYE, H.: *Textbook of Endocrinology* Acta Endocrinologica. Universite de Montreal, Montreal, Canada, 1947 p. 636
18. ZONDEK, B.: Importance of increased production and excretion of gonadotropic hormone for diagnosis of hydatidiform mole. *J. Obst. & Gynaec. Brit. Emp* 49: 397-411, Aug 1942.
19. JONES, G. E. S.; GEY, G. O.; and GEY, M. K.: Hormone production by placental cells maintained in continuous culture. *Bull. Johns Hopkins Hosp* 72: 26-38, Jan 1943.
20. SMITH, O. W., and SMITH, G. V.: Tests for pregnancy. *J. Clin Endocrinol.* 4: 551, Nov 1944
21. ROBBINS, S. L.: Medical progress: pregnancy tests. *New England J. Med.* 239: 369-373, Sept 2, 1948.

# An Evaluation of the Treatment of Chronic Osteomyelitis

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SEVENTY-TWO cases of chronic osteomyelitis observed and treated over a period of 20 months are presented in order to compare the results of several methods of treatment. The average age of the patients in this series was 25, the youngest was 19 and the oldest was 36. In 90 percent, the etiologic factors were either gunshot wounds or compound fractures from other causes, 5 cases followed open reduction, and in 3 the lesion was hematogenous. Bacteriostatic agents including penicillin, streptomycin, and the sulfonamides were used systemically in each case according to the indication determined by the type of organism and its sensitivity and resistance. None was used locally in conjunction with any of the surgical procedures. The most common organism recovered from the wounds was hemolytic *Staphylococcus aureus* (61 percent). Others included *Proteus*, *Staph. albus*, *Staph. aureus*, and *Bacterium coli*, in that order. The average period of drainage, preoperatively, was 12 months.

## SURGICAL TREATMENT

The incidence of bone involvement in 72 cases was as follows: tibia, 30 (42 percent); femur, 16 (22 percent); humerus, 8 (11 percent); ulna, 4 (6 percent); elbow, 3 (4 percent); radius, 2 (3 percent); pelvis, 2 (3 percent); finger, 2 (3 percent); ankle, 2 (3 percent); scapula, 1 (1 percent); os calcis, 1 (1 percent); and hip, 1 (1 percent).

The various operative procedures employed, together with the results in terms of postoperative drainage, are shown in table 1. The average period of drainage postoperatively for the entire series was 2 months. In 35 cases, or 49 percent, there was no drainage. In the remaining 37, or 51 percent, drainage persisted for an average of 3½ months.

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TABLE 1

Type of operation	Number of cases	Percent of series	Number of cases with no postoperative drainage	Percent with no postoperative drainage
Sequestrectomy	36	50	13	39
Saucerization	17	21	9	53
Saucerization plus muscle pedicle flap	7	10	6	86
Sinusectomy	5	7	4	80
Saucerization plus iliac chips	3	4	0	0
Sequestrectomy and epithelialization	2	3	1	50
Amputation	1	1	1	100
Resection of tibia	1	1	1	100
Total	72	100	35	

For purposes of comparison, the number of amputations and resections of the tibia, as well as the sequestrectomies and epithelialization, should not be included as they are too small in number to be of any significance. The latter cases consisted simply of the application of either split thickness or pinch grafts to the granulating areas within the depths of the wounds. In the small number treated by implantation of iliac bone chips in the manner described by Prigge (2), results were uniformly poor. However, in the cases treated by filling the defect with a muscle pedicle flap, a procedure referred to by Starr (4) as early as 1922, and described by Mercer (1) in 1933, the results were good enough to warrant further comment and more detailed analysis. It will be noted that the highest percentage of cases which remained closed (86 percent), fell in this group. This is essentially the same as the figure reported in a larger series by Stark (3) (84 percent).

Of the 7 cases treated by this method, 6 involved the femur, and in none of these was there any drainage postoperatively. The average period of preoperative drainage had been 13½ months. The remaining case involved the humerus, and in this case drainage persisted for 1 month postoperatively.

In order to provide a basis of comparison of methods of treatment and results obtained on specific bones, the following analyses of treatment of the femur and the humerus are presented. In 16 cases of osteomyelitis of the femur, the following operations were done: Muscle pedicle flap in 6 cases—no postoperative drainage; sequestrectomy in 5 cases—no postoperative drainage in 40 percent, the average period of postoperative drainage was 2 months; saucerization in 4 cases—no postoperative drainage in 50 percent, the average period of postoperative drainage was 3 months; and sinusectomy in 1 case—no postoperative drainage.

In 8 cases of osteomyelitis of the humerus the following operations were done: Sequestrectomy in 4 cases—no postoperative drainage in 25 percent, the average period of postoperative drainage was 1



month; saucerization in 3 cases—no postoperative drainage in 33 percent, the average period of postoperative drainage was 2 months; and muscle pedicle flap in 1 case with postoperative drainage for 1 month.

### CASE REPORTS

**Sequestrectomy**—S M C, a 19-year-old man, was admitted on 22 September 1946 with a history of pain and swelling of the left knee of 3 months' duration. One week following admission the patient sustained a fracture of the left femur. Roentgenograms showed rarefaction and a moth-eaten appearance of the bone (fig 1). The leg was placed in traction and later in a hip spica. On 13



Figure 1.—Pathological fracture, periostitis, and osteomyelitis areas (18 November 1946)



Figure 2.—Sequestrum of fracture site (5 March 1947).

January 1947, check films showed the formation of a sequestrum at the fracture site (fig 2). Two months later a sinus developed, and on 7 March 1947, a sequestrectomy was performed with primary closure. Seven months later, there was no evidence of infection or drainage (fig 3).



Figure 3.—Four months after operation (15 July 1947).

**Saucerization**—L J R, a 23-year-old white man, had an acute hematogenous osteomyelitis followed by drainage from the right hip on 21 December 1945. He was transferred to this hospital on 24 March 1946 with the leg in a hip spica. After removal of the cast the leg continued to drain in spite of massive doses of penicillin and local

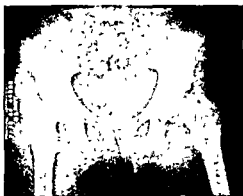


Figure 4.—Osteomyelitis of head of femur and sequestrum in acetabulum (18 July 1946).



Figure 5.—One year later, 8 months postoperatively, showing healing and beginning fusion.

irrigations with tyrothricin (fig 4). On 7 November 1946, the acetabulum was saucerized, with removal of almost the entire iliac portion. The femoral head was denuded and a hip fusion was performed. The drainage ceased. However, on 28 December 1946, two sinuses appeared over the right buttock, and the cast was removed. Cultures revealed *Bacillus proteus*. The patient was given streptomycin, but no alteration in drainage occurred. On 4 March 1947, a sinusotomy of the right buttock was performed and numerous connecting sinuses were found in the fascial and muscle planes. These were completely resected and the incision closed primarily. No drainage occurred subsequently (fig 5). On 15 September 1947 roentgenograms showed complete fusion of the right hip.



Figure 6.—Anteroposterior view showing sequestrum and necrotic areas (29 July 1946).



Figure 7.—Lateral view before operation.



Figure 8.—Postoperative roentgenogram.



Figure 9.—Preoperative film, showing sinus injected with lipiodol.

1945. The wound apparently healed, but every 1 to 2 months abscess formation and drainage occurred. On 19 September 1946, a sinusectomy was performed and closed tightly and primary healing occurred (fig 3). Five months later the patient was discharged to duty. He had had no recurrence.

**Saucerization and iliac graft**—I. T. S., a 30-year-old white man, sustained a compound gunshot (mortar) fracture of the upper third of the right tibia with loss of bone substance. A mixed pyocyanous infection followed. On admission to this hospital, 5 months later, the tibia had healed except for a bony defect of the anterior portion of the upper tibia which discharged foul, purulent material. Cultures revealed nonhemolytic staphylococcus and pyocyanase. Seven months after admission, saucerization and sequestrectomy was performed. The wound continued to drain profusely, clearing up after 10 months of local therapy with penicillin and tyrothricin. The cavity remained and a moderate discharge persisted (fig 10). On 24 September 1946, a second sauceriza-

**Saucerization and muscle pedicle flap**—W. S. B., a 26-year-old white man, sustained a compound gunshot fracture of the left femur on 6 June 1945. The leg had been immobilized in a cast and the patient was transferred to this activity (figs 6 and 7). On 19 September 1946 the fracture was well healed, but drainage persisted. At this time a saucerization and muscle pedicle flap operation was performed on the left femur. The incision healed primarily, but 1 month following surgery a small sinus appeared, from which a suture was removed. The sinus healed primarily within 10 days and the patient was discharged from the hospital 6 months later, with no drainage and a full range of motion of the left knee and hip (fig 8).

**Sinusectomy**—N. L. H., a 34-year-old white man in October 1944 sustained a compound gun-shot fracture of the neck of the left femur. Saucerization was performed in May



Figure 10.—Large cavity, prior to filling with iliac chips (16 August 1946).



Figure 11.—Four weeks after placing of iliac chips (15 November 1946).

tion and sequestrectomy was performed, followed by multiple iliac chip grafts on 17 October 1946. On 2 November 1946 the entire area became infected. A culture at this time revealed hemolytic streptococcus, gram-negative rods and *B. subtilis*. The wound was irrigated with acetic acid and tyrothricin alternately, without result (fig. 11). On 23 November 1946 the wound was completely cleaned out, and no viable bone chips were found. The patient was later discharged from the hospital although the wound was still draining.

**Amputation.**—F. L. V., a 25-year-old white man sustained bilateral compound trochanteric gunshot fractures of the femurs on 29 July 1945. The patient

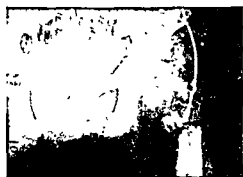


Figure 12.—Preoperative film (reversed in printing), showing massive infection of neck and upper shaft of right femur.

was admitted to this hospital on 20 June 1946 in a hip spica with multiple decubitus ulcers and a foul, purulent discharge from the wound in the right thigh. He had an ununited, comminuted, trochanteric fracture of the right femur; the left femur had united. Cultures at this time revealed gram-negative rods and streptococci. He also had bilateral urinary calculi and a pyelitis which was resistant to local treatment (fig. 12). On 6 January 1947 a disarticulation of the femur was performed and the stump allowed to granulate (fig. 13). Seven months later the patient was discharged from the hospital, free from wound drainage and urinary complications. He had gained 30 pounds in weight.



Figure 13.—Three months after disarticulation of right hip.

**Resection of middle third of tibia.**—R. L. C., a 22-year-old white man, sustained a compound, comminuted fracture of the tibia on 23 May 1946. Three days later an open reduction and débridement, and immobilization of the fracture with a Lane plate, was done. Osteomyelitis occurred and the patient was transferred to this activity on 3 November 1946. The plate was removed on 13 December 1946, but the infection continued. On 28 February 1947, roentgenogram showed the middle third of the tibia to be sequestering (fig. 14). On 4 March 1947 approximately 8 inches of the tibia was removed by block resection. The wound was closed tightly and it healed primarily (fig. 15). On 11 August 1947 the defect was replaced with a combined fibular and iliac graft (fig. 16). At the present time, approximately 3 months later, there has been no drainage.



Figure 14—Massive sequestration of large tibial fragment, immediately before operation



Figure 15.—Three months after block resection



Figure 16—Split fibular intramedullary and onlay grafts in place (on right); opposite leg from which graft was removed (on left).

### SUMMARY

Seventy-two cases of chronic osteomyelitis have been reviewed in an attempt to demonstrate the relative value of several forms of surgical treatment.

Although the number of cases included in the several categories is not large, it is concluded that the use of the muscle pedicle flap, which produced excellent results in 86 percent in this series, is the method of choice in the treatment of chronic osteomyelitis.

The use of iliac chips to fill existing cavities in bone was not successful in any case in this series.

Complete excision of the lesion, whether of the bony or the soft tissues, as in the case of massive resection or sinusectomy, will produce an almost perfect result in practically all cases.

### REFERENCES

1. MESSER, W: Orthopedic Surgery William Wood and Co., Baltimore, Md., 1933.
2. PRIGG, E. K. Treatment of chronic osteomyelitis by use of muscle transplant or iliac graft J Bone & Joint Surg 28: 576-583, July 1946
3. STARR, W. J. Use of pedicled muscle flaps in surgical treatment of chronic osteomyelitis resulting from compound fractures J Bone & Joint Surg. 28: 343-350, April 1946
4. STARR, C. L. Acute hematogenous osteomyelitis. Arch Surg 4: 567-587, 1922



# Endometriosis of the Urinary Bladder

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IN 1921, Judd (1) published the first case of "Adenomyoma presenting as a tumor of the bladder." Until 1943, when Moore, Herring, and McCannel (2) presented a critical analysis of the literature, there were only 46 cases on record; since then 19 more cases have been added. The authors believe that this problem should be brought to the attention of the gynecologist as the recognition of the disease at the time of surgery and a knowledge of correct treatment are important to him as well as to the urologist.

## CASE REPORT

D. W., a 29-year-old white gravida I, Para 0, was admitted to the hospital on 24 December 1948, complaining of a dull constant pain in the left lower quadrant of the abdomen with sharp knife-like exacerbations every 1 to 2 minutes, which lasted only a few seconds and radiated to the left flank. The pain was severe enough to double her up. There were no urinary complaints, no nausea or vomiting, but she had been constipated for the past 2 or 3 days. She stated that the pain was just like that which she had had in 1941 just before her right tube was removed for a ruptured ectopic pregnancy; the appendix had also been removed then.

Her last menstrual period was 17 November 1948 and was normal, lasting 2 days. Ten days prior to onset of the present illness she spotted for 2 days, but this was not as heavy as a normal period.

Her menarche was at the age of 18, her periods were regular, every 28 days, lasting 2 days. There was no dysmenorrhea, dysuria, hematuria, or other complaints. A review of systems was negative.

Physical examination revealed only questionable tenderness in the left lower quadrant of the abdomen. There was no rebound tenderness. (The patient was quite apprehensive and pelvic examination had to be done under sodium pentothal anesthesia.) Pelvic examination showed: external genitalia normal; Bartholin's and Skene's glands normal; vaginal and cervical mucosa clean; cervix somewhat dusky in color but otherwise normal; uterus small, hard, anterior, and movable; right adnexa, small and hard, a mass, 2×3 cm., probably ovary, was palpated; the tube was not palpable, left adnexa contained a soft mass, 3×4 cm., close to the uterus which was thought to involve the tube.

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*Impression.*—Left ectopic pregnancy unruptured

Laboratory data Urinalysis was within normal limits, hemoglobin, 13 gm.; and red and white blood cell counts were within normal limits

*Operation.*—The abdomen was opened through the usual lower midline approach. The right tube and ovary had been removed surgically. The left tube and ovary were adherent to the sigmoid and the sigmoid was kinked on itself by an adhesion to the left tube. The tube and ovary were freed from the bowel and a mass, 2×3 cm., was found lying under a vesico-uterine fold of peritoneum. A small piece of omentum adherent to this area was freed revealing a fixed mass underlying the peritoneum. There were no endometrial implants in the pelvis. An attempt was made to shell the mass out of the dome of the bladder where it seemed to lie, the bladder was entered because the mass apparently involved the bladder musculature. On opening the bladder the inner border of the mass, which contained numerous bluish cysts, could be seen lying submucosally. The first impression was that this was a neoplasm but the possibility that it was an endometrioma was also considered. The mass and a margin of bladder wall were excised. The bladder was then closed around a No. 18 Foley catheter which was brought out through the lower end of the wound. The peritoneum was closed so as to extraperitonealize the cystostomy wound and the abdomen was closed in layers. A Foley catheter was also placed in the bladder through the urethra and continuous suction was applied to both catheters for 7 days. The wound healed primarily and the patient left the hospital on 13 January 1949, 18 days postoperatively.

*Pathologist's report*

One surface of the specimen is covered by mucosa beneath which are numerous cystic structures averaging 0.3 cm. in diameter and which have a reddish brown color.



Figure 1.—Endometriosis of the wall of the urinary bladder showing endometrial glands surrounded by endometrial stroma embedded in bladder musculature.

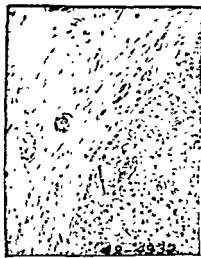


Figure 2.—High-power view of figure 1 showing fat and hemosiderin-filled macrophages in the cystic area.

**Microscopic examination.**—Sections of urinary bladder show small glandular structures deep in the muscularis. These are lined by cuboidal to columnar epithelium resembling that of the glands of the endometrium of the uterus (fig. 1). About these glands is a small amount of stroma consisting of densely packed hyperchromic ovoid cells. Those glands located toward the mucosa and beneath transitional epithelium are much larger and are lined by low cuboidal epithelium, and contain hemosiderin and fat-filled macrophages (fig. 2). The cellular response indicates old hemorrhage (fig. 3). Since the surface epithelium is intact, it is doubtful that hemorrhage occurred into the urinary bladder. In other areas there is dense fibrous tissue containing hemosiderin-filled macrophages, representing hemorrhage into stroma from ruptured glands with resultant scarring. The muscularis appears slightly hypertrophied throughout and the serosa is unremarkable.

**Diagnosis.**—Endometriosis of urinary bladder.



Figure 3.—Low-power view of bladder mucosa with a cystic area into which old hemorrhage has occurred.

## DISCUSSION

There are four schools of thought as to the origin of endometriosis: (a) as a remnant of the wolffian (von Recklinghausen (3)) or Müllerian duct (Kossman (4)); (b) metaplasia from normal endothelial cells of the peritoneum, due to some hormonal or traumatic influence on the cells (Iwanoff (5)); (c) from normal endometrial tissue reaching aberrant positions as a result of direct extension (Cullen (6)), reflux of menstrual blood through the fallopian tubes (Sampson (7)), or by way of the lymph and blood vessels from the uterine cavity (Halban (8)); and (d) from derivatives of celomic epithelium (Waldeyer (9), Meyer (10), and Novak (11)). Each school of thought can produce cases to prove their theory and disprove the others so the question has yet to be settled.

Goodall (12) is a strong proponent of the third school. He believes there are two types of endometriosis depending upon the specific cell structure. The first type is called stromatous endometriosis because it comes from the stromal cells alone. The second type he calls the mixed type because it comes from the lining cells of uterine secretory glands and also has stromal cells present. As only the superficial layers of the endometrium respond to the monthly cycle, this holds for the ectopic cells as well. He indicates that there are three modes



of invasion of the bladder in the formation of an endometrioma. The first is direct, by lymphatic continuity or backflow from the deep uterine mucosa through the uterine wall. The second is indirect, from implants in the peritoneal vesico-uterine pouch and then into the muscularis and mucosa. The third is due to traumatic displacement of endometrial cells following surgery. He also divides bladder endometriosis into three groups. Group I is composed of cases of stromatous endometriosis and involves the trigone and base of the bladder derived directly from the deep layers of the uterine mucosa. Group II is composed of cases of involvement of the fundus from peritoneal endometriosis. The majority of these follow injury to the bladder at the time of surgery. Robert Meyer (13), in 1930, classified bladder endometriosis into three groups according to their origin: (a) internal endometriosis with origin probably from bladder epithelium; (b) external endometriosis with origin from serosal cells; and (c) collision endometriosis resulting from Groups I and II.

The case presented shows that there may be extensive involvement of the bladder without symptoms. However, this is a very rare occurrence in an uncommon disease entity. The classical picture is cyclic dysuria, urinary frequency, and hematuria. Hematuria associated with the menstrual period was present in only 13 of the 46 cases reported by Moore et al. (2). Urgency is usually associated with urinary frequency. Suprapubic pain with or without a menstrual period is also a common complaint. All the symptoms of pelvic endometriosis may be present and are an aid in the differential diagnosis. Relief of the symptoms during pregnancy is a good diagnostic sign, as is the cessation of the complaint with cessation of ovarian activity. The question of sterility is difficult to evaluate from the case reports in the literature, as that factor is usually omitted in the articles, but it is something to be aware of as possible diagnostic aid.

If endometriosis is suspected, cystoscopic examination should be done and, although a typical picture may not be present, the history and findings will usually indicate the correct diagnosis. Phillips (14) has an excellent series of colored plates demonstrating the typical cystoscopic findings.

The youngest patient was 18 and the oldest 48 years of age. The average age is between 35 and 39 years.

Kcene and Kimbrough (15) in 118 cases of endometriosis, and Holmes (16) in 145 cases of endometriosis, each found bladder invasion in 2 cases.

The treatment of endometriosis of the bladder is dependent upon two things: the age of the patient and her child-bearing potentialities. If she is young and wishes to have children, then excision is

the treatment of choice, as the percentage of complete cures is very high. If the patient is approaching the menopause, irradiation of the ovaries to check ovarian activity is sufficient; regression of the lesion will follow and no further treatment is necessary. Castration by surgical means accomplishes the same end. Fulguration by the transurethral route is to be condemned according to Moore et al. (2).

If the patient is young and the lesion is too extensive for surgical extirpation or if the lesion is encroaching on the ureteral orifices, then the most effective treatment is castration.

The case reported presents several interesting features. At no time did the patient have any urinary complaints. Cyclic bladder complaints were present in 40 of the 46 cases reported upon by Moore et al. (2) and were present in every case reported since. Cystoscopic examination of this patient prior to surgery would have been interesting, but there was no reason to suspect bladder disease. It is unlikely that the vesico-uterine fold of peritoneum was damaged at the operation for ruptured ectopic pregnancy; however, in the series reported by O'Connor and Greenhill (17) of 58 cases of endometriosis of the bladder, 35 had had previous surgery; and the condition was most frequently seen following hysterectomy.

This patient had no other evidence of endometriosis.

#### REFERENCES

1. Judd, E. S.: Adenomyoma presenting as tumor of bladder. *S. Clin. North America* 1: 1271, Oct. 1921.
2. Moore, T. D.; Herring, A. L.; and McCann, D. A.: Some urologic aspects of endometriosis. *J. Urol.* 49: 171-177, Jan. 1943.
3. Von Recklinghausen, F.: Die Adenomyome und Cystadenomyome der Uterus und Tuben Wandung. A. Hirschwald, Berlin, 1896.
4. Kossman, R.: Die Abstammung der drüsenanschlüsse in den adenomyomen des uterus und der tuben. *Arch. F. Gynäk.* 51: 359, 1897.
5. Iwanoff, N. S.: Drüsiges cystenhaltiges uterus-fibromyom compliciert durch sarcom und carcinom (Adenofibromyoma Cysticum Sarcomatoses Carcinomatosum). *Monatschr. f. Geburtsh. u. Gynäk.* 7: 205, 1898.
6. Cullen, T. S.: Adenomyoma of round ligament. *Bull. Johns Hopkins Hosp.* 7: 112, 1896.
7. Sampson, J. A.: Perforating hemorrhagic (chocolate) cysts of ovary. *Arch. Surg.* 3: 245, 1921.
8. Halban, J.: Hysteroadenosis metastatica (die lymphogene genese der sog. adenofibromatosis heterotopica). *Wien klin. Wchnschr.* 37: 1205, Nov. 20, 1924.
9. Waldfyfer, in Goodall, J. R.: A Study of Endometriosis. J. B. Lippincott Co., Philadelphia, Pa., 1943.
10. Meyer, R.: Handbuch der Gynaekologie, Vol. 1. J. G. Bergman, Wiesbaden, 1907.
11. Novak, E.: Gynecological and Obstetrical Pathology. 2d edition. W. B. Saunders Co., Philadelphia, Pa., 1947.

12. GOODALL, J. R : Urinary complications of pelvic endometriosis. *Ann Surg* 120: 891, 1944.
13. MEYER, R : Adenomyosis, Adenofibrosis und Adenomyom. *Veit-Stoekel Handbuch der Gynäkologie* J J Bergmann, Munchen, 1939.
14. PHILLIPS, R. B : Endometriosis vesicae. *J Obst. & Gynaec. Brit Emp.* 41: 165-189, April 1934.
15. KEENE, F E., and KIMBLOUGH, R A., JR. Endometriosis; review based on study of 118 cases *J A M A* 95: 1164-1168, Oct. 18, 1930.
16. HOLMES, W R : Endometriosis *Am J. Obst. & Gynec* 43: 255-266 Feb 1942.
17. O'CONNOR, V J and GREFFHILL, J P : Endometriosis of bladder and ureter *Surg, Gynec. & Obst* 80: 113-119, Feb 1945.

## BIBLIOGRAPHY

1. ADAMS P S : Endometriosis of bladder, report of case *J Urol* 40: 390-396, Sept 1938.
2. BALFOUR, D C., JR. Endometrioma of urinary bladder report of 3 cases *Proc. Staff Meet., Mayo Clin* 20: 129-133, May 2, 1945.
3. DREYFUS, M L. Pathologic and clinical aspects of adenomyosis and endometriosis survey of 224 cases. *Am J Obst. & Gynec* 39: 95-99, Jan. 1940.
4. HENRIKSEN, E : Primary endometriosis of urinary bladder, report of 1 case *J. A M A* 104: 1401-1403, April 20 1935.
5. KAHLE, P J VICKERY G W., and MAITREY E : Endometriosis of urinary bladder, report of 2 additional cases *J Urol.* 46: 52-56, July 1941.
6. KRETSCHMER, H L : Endometriosis of bladder *J Urol* 53: 459-465 March 1945.
7. MARK, E. G. : Endometriosis of bladder *J Urol* 37: 799-807, June 1937.
8. NIXON, W C W : Endometriosis of bladder *Lancet* 1: 405-406, March 2, 1940.
9. OCKLEY E A., and HEIWEIG F C : Endometriosis of urinary bladder with report of case *J Urol* 55: 464-469 May 1946.
10. RANNEY B : Etiology of endometriosis *Internat. Abst Surg* 86: 313, April 1948.
11. WHITEHOUSE, H B : Endometrioma invading bladder removed from patient who had never menstruated. *Proc Roy Soc Med.* 19: 15, 1926.



# Hutchinson-Besnier-Boeck Sarcoid

## Report of Three Cases and Review of the Literature

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THE word sarcoid was derived from the two Greek roots meaning "flesh" and "form." Boeck (1) called the disease sarcoid because he believed the histological picture resembled the small cells of sarcoma.

### HISTORY (2)

In 1869 Hutchinson described the first case of skin involvement but failed to name the disease. In 1889 Besnier described lupus pernio and called it "Mortimer's malady" (after the patient's name). In 1889 Boeck described the disease and its histology under the title multiple benign sarcoid; later he called it "benign miliary lupoid." In 1902 Kienbock described the cystic bone changes but believed syphilis to be the cause. In 1915 Kutzinsky and Bittorf described the pulmonary lesions and correlated the skin with the lung lesions. In 1917 Schaumann integrated histologically the skin and lymph node lesions. In 1932 Kissmeyer summarized the previous contributions and added a few of his own. In 1936 Schaumann reported his 20 years of observation of the disease. In 1937 Longcope and Pierson (3) stimulated American interest in this disease.

### CLINICAL ASPECTS

Sarcoidosis is usually a benign systemic disease involving the reticulo-endothelial system. This is a disease of the second and third decades with no sex predilection but with a greater incidence in the American Negro. The predominance of certain visceral involvement led to the description of several clinical entities.

Skin lesions appear in about 50 percent of patients with sarcoidosis. Some authors (4) (5) claim that when complicating visceral tuberculosis occurs the skin lesions may disappear.

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There are several specific dermatological manifestations of this disease:

(a) The Boeck-type (1) occurs most frequently in women. The areas involved include the face, especially the nose, mouth, and eyelids, the back of the shoulders, and the extensor surfaces of the arms. The lesions are papules, nodules, or infiltrating plaques; annular or gyrate. They are firm, elastic, round, and brownish-red. Occasionally telangiectases and superficial scaling occur. Sometimes under pressure the nodules seem to be composed of grayish-yellow foci which suggested to Boeck "miliary lupoid." When the lesions disappear atrophic pigmented areas remain.

(b) Lupus pernio (6) (7) is confused with chilblain lupus (Hutchinson), a type of discoid lupus erythematosus. The lesions are bluish-red, infiltrated, and in symmetrically placed plaques. The areas involved are the nose, ears, forehead dorsal surfaces of the hands, and occasionally, the toes. Telangiectatic vessels are usually present over the surfaces of the lesions. The phalanges are often involved and present a fusiform deformity.

(c) The angiolupoid type was described by Brocq and Pautrier (8) in 1913 (7). The lesions are nodules and plaques; bluish-red occasionally tinged with yellow, and there are numerous telangiectatic vessels over their surfaces. They are located on the sides of the nose, inner ocular canthi, and cheeks.

(d) Erythrodermic type of sarcoid was described by Schaumann (9) in 1924. This form appears as large serpiginous, red scaling, noninfiltrating areas on the front of the legs and thighs. Pautrier described erythroderma of this type associated with lupus pernio of the face.

Nonspecific eruptions such as prurigo and urticaria may be present. Erythema nodosum may also be associated with this condition.

(e) In 1906 Darier and Roussy (10) (11) described a type of sarcoid. The lesions consisted of painful nodules in the hypoderm in areas of adipose tissue. They sometimes occur in chains following the blood vessels. This causes confusion with erythema induratum which some authors believe to be a sequela of this type of sarcoid. The lesions are limited to the trunk and lower limbs. They vary in size from a bean to a walnut and in color from that of normal skin through different shades of red. Occasionally they flatten out to form plaques. They are usually numerous, never ulcerate, or metastasize and, when they subside, fibrosis may result. This type of sarcoid is now being recorded more frequently with the Boeck type.

There are two skin diseases which have frequently been erroneously classified as cutaneous sarcoid. These are the sarcoid-type of tuberculosis of the American Negro and the sarcoid of Spiegler-Fendt.

Nonland, Crawford, Klauder, and Thomas (12) believe that the sarcoid-type of tuberculosis of the American Negro is tuberculosis of the skin of hematogenous origin which assumes sarcoid features due to an unusual immunological reaction on the part of the patient. Thomas presented 11 cases illustrating five main types of cutaneous lesions. The superficial lesions, which on healing left atrophic scarring, resembling discoid lupus erythematosus. The small papules about the eyes, nose, and mouth resembled psoriasis. There were brownish indurated plaques assuming annular configuration with central atrophy. The nodular ulcerative lesions on the legs resembled, in appearance and course, those of erythema induratum. There were also subcutaneous cherry-sized nodules on the body. Reisner (13) described cutaneous tuberculosis in the American Negro as having the following characteristics: sarcoid-type of skin lesions; skin histologically on a borderline between sarcoid and tuberculosis; positive tuberculin test; and, in some patients, subsequent caseous tuberculosis in various viscera.

The sarcoid of Spiegler-Fendt actually is lymphosarcoma. Spiegler and Fendt realized that they were not dealing with sarcoma and called the lesions a type of "sarcoid." In 1935 Lewis (14) reviewed the literature and summarized his impressions. There are two types of lesions: the localized superficial benign type, which may disseminate; the lesions are few in number, tend to be grouped, appear in any part of the body, and resemble the miliary sarcoid of Boeck; the disseminate type has varying numbers of nodules, plaques, and tumors which vary from the color of skin to reddish-blue, occur anywhere on the cutaneous surface, and may involve any organ of the body. All of these types are histologically reticulum cell lymphosarcoma. The outcome in the disseminate type may be unfavorable. There is an absence of the clumping of the naked nuclei of granuloma fungoides, of intracellular nuclear proliferation of lymphogranulomatosis, and of the Dorothy-Reed cells of Hodgkin's disease.

The diagnosis of systemic sarcoidosis is made from the clinical picture, radiological examination of the chest and small bones, anergic reaction to high concentrations of tuberculin, absence of tubercle bacilli in involved areas, and skin biopsy. The signs and symptoms depend on the organs involved. There may be fever (unusual), generalized malaise, fatigue, and weight loss. The skin, eyes, salivary glands, lungs, bones, and lymphatic system are the more common sites of involvement; however, hypophyseal (15), tonsillar (9), laryngeal, breast, cardiac (16), intestinal, pancreatic, and testicular infiltrations have been described.

Uveoparotitis was described in 1909 by Heerfordt (17). He designated the inflammation of the parotid gland and the iris as a localized type of sarcoid. This phase of sarcoidosis occurs in about 10 percent.

Other salivary glands may be involved. Fever may precede or accompany the early stages. The firm and painless swelling of the parotid gland usually precedes the ocular involvement. The inflammation of the parotid gland is confined to the capsule and may persist from 2 to 6 months. The uveitis is the most common ocular lesion; however, corneal herpes, corneal opacities, vitreous hemorrhages, optic neuritis, chorioretinitis, glaucoma, nodular conjunctivitis, and infiltration of the adnexa have been described (18). In one-third of the cases facial nerve paralysis occurs, and in one-half of these cases it is bilateral. Erythema nodosum or toxicum has been described as accompanying some of these cases. This disease has been classified under Mikulicz's syndrome because symmetrical lacrimal and parotid gland involvement has been described.

In 1924 Martenstein (19) found the roentgenographic incidence of hilar involvement to be about 31 percent. He described the characteristic roentgenographic lesions to be enlarged hilar nodes, atelectasis, chronic interstitial fibrosis, and the "ground glass effect." King (20), and Bernstein and Sussman (21) have described the roentgenographic chest findings. Leitner, Bernstein, and Sussman (21) and Rubin (22), classified the roentgenographic features into phases for descriptive purposes, but one must remember the lung changes are not static and that the pulmonary picture is usually changing from one phase into another. Three phases of pulmonary involvement are described. The hilar phase is the most common and can usually be seen in a chest roentgenogram. The hilar lymphadenopathy, which is usually bilateral and symmetrical, involves both peribronchial and right peritracheal nodes. The transitional phase develops with diminution of hilar lymphadenopathy and the infiltration of the adjacent parenchyma. The process, unlike tuberculosis, spreads to the middle and lower lobes. In erythema nodosum similar hilar adenopathy has been described but the skin lesions and the course of the thoracic lesions are important differential points. The parenchymal phase is characterized by reticulation, stippling, or marbling. Infiltration is greatest in the middle and lower lobes. This phase poses roentgenologic diagnostic problems. The reticulation resembles lymphangitic carcinoma; the stippling resembles hematogenous tuberculosis; and the marbling resembles metastatic carcinoma. The pleura is often involved but pleural effusion is rare unless there is the complication of heart failure or active tuberculosis. With massive parenchymal involvement, this disease can resemble any fibrosing or ulcerating lung disease but the roentgenologic picture is out of proportion to the patient's symptoms.

In 1934 Nielsen reported the incidence of bone lesions to be 20 percent. Schaumann (5) believed that the marrow is the starting point

of sarcoidosis. In 1919 Jüngling called the lesions "osteitis tuberculosa multiplex cystoides." In 1931 Kirklin and Morton (23), and in 1938 Ellis (24) described the lesions accurately. The two pathologic findings are a thickening of the trabeculae and clear cystic changes. The phalanges of the hands and feet are almost always involved. Skin lesions are usually present. The lesions occur predominantly in young adults. There is no sinus formation, sequestration, joint, or periosteal involvement. The lesions must be differentiated from tuberculous or syphilitic dactylitis, blastomycosis, chondromatosis, and osteitis fibrosa cystica.

Boeck noted the lymphadenopathy in his original description. Schaumann (5) described this disease as an affection of the lymphohematopoietic system exhibiting lesions of the cutaneous and visceral lymphatic structures.

Of the cases of sarcoidosis about one-third to one-half will undergo spontaneous healing. In the remaining half, 50 percent may become chronic and show organic involvement of irreparable nature and the other 50 percent may develop tuberculosis. As Rubin and Pinner (25) stated the benign nature of this disease has been overemphasized. The causes of death in sarcoidosis are complicating tuberculosis, dysfunction of vital organs through invasion, pulmonary infarction, and widespread amyloidosis.

Consideration of the differential diagnoses must include the following:

<i>Skin diseases</i>	<i>Systemic disease</i>
Nodular-type of discoid lupus erythematosus	Tuberculosis.
Erythema induratum	Hodgkin's disease.
Hodgkin's disease of skin	Deep fungus infections:
Nodular tuberculosis	Coccidioidomycosis.
Mycosis fungoides	Aspergillosis.
Leprosy	Chemical granulomatoses:
Syphilis	Berylliosis.
Neurofibromatosis	Silicosis.
Leukemia cutis	Asbestosis.
Lymphangioma cutis	Syphilis.
Multiple lipomas	Leprosy.
	Gonorrhea
	Gout.
	Lymphatic leukemia.
	Lymphosarcoma.
	Metastatic carcinoma

## ETIOLOGY

Most investigators believe the etiologic factor to be a reaction of immunity to the tubercle bacillus or its products. Darier classified Boeck's sarcoid with the tuberculids. Pinner (4) believes that sarcoid is noncaseating tuberculosis and that the noncaseating lesions may



undergo caseation. Reinstierna and Filho (26) believe that the whole picture can be produced by leprosy. Schaumann (5) believed the bovine bacillus to be responsible. Snapper advanced a virus as the cause. Kveim made an antigen from lymph nodes of patients with sarcoid thinking that sarcoidosis might be a virus disease like lymphopathia venereum. He believed his skin test to be as specific and allergic as the Frei test; however, the usefulness of the test is hindered because of lack of standardization and the occasional slow response to the test.<sup>2</sup>

In view of the failure of animal inoculation, the problem is to explain the negative tuberculin test. Sulzberger (27) found that in persons with sarcoidosis the tuberculin test was negative more often than in healthy persons. Lender (28) and others explain the anergic state as a specific alteration in the capacity of tuberculous patients to react to tuberculin. In 1921 Maitenstein advanced the idea that the negative tuberculin test in those patients resulted from the presence in the blood serum of tuberculin neutralizing factors known as "anticutins." Pinner, Weiss, and Cohen demonstrated the presence of "anticutins" in the serum of 5 percent of normal and tuberculous patients, and in 36 percent of the patients with sarcoidosis. The presence of "anticutins" in sarcoid was found less frequently than the negative tuberculin test. Other authors have not been as successful in demonstrating these "anticutins."

#### HISTOLOGY

The basic histologic lesion is the "hard tubercle." Under the microscope one sees a uniform and monotonous picture. The characteristic lesion is a circumscribed collection of epithelioid cells with a few scattered Langhans-type of giant cells and a lack of lymphocytic response. Central necrosis or caseation is always absent. The microscopic picture of sarcoid must be differentiated from that of tuberculosis. Caseation or polymorphonuclear response of tuberculosis does not occur in sarcoid. The giant cells of sarcoid differ from those of tuberculosis in that they are larger, more nucleated, seldom arranged in elliptical manner, and contain Schaumann's inclusion bodies. A greater uniformity of proliferative type of tissue response is seen in sarcoid. The lesions of the liver, when involved in sarcoid, occur in the portal triad with only a few in the midzones of the lobules while the reverse is true when the liver is involved in tuberculosis. Unlike tuberculosis, the reticulum is not destroyed in sarcoid.

#### LABORATORY DATA

Harrell and Fischer (29) have reported hyperproteinemia, hyperglobulinemia, increased blood calcium and phosphatase in the active

<sup>2</sup> It may sometimes take as long as 6 months for a positive Kveim test to develop.

cases; the blood chemistry values become normal when the lesions heal. Reisner (19) stated that monocytosis occurs more frequently in the early or the disseminating phase. There is usually an eosinophilia and an elevated sedimentation rate which will persist even in the asymptomatic chronic phase. A false positive blood Wassermann test is found occasionally. In uveoparotid fever there may be a pleocytosis and an increased protein in the cerebrospinal fluid. Other changes in the blood picture and chemistry may result from the infiltration of vital organs such as massive pulmonary involvement with secondary polycythemia.

### TREATMENT

The treatment of this disease is at best palliative and symptomatic. In the generalized type, arsenic has been used, but the hazard of large doses over long periods of time must be recognized. High voltage roentgen therapy has proved beneficial occasionally for the skin lesions, but it is of questionable value for systemic involvement; Pohle, Paul, and Clark (30) had favorable results in 8 of their 14 cases with hilar adenopathy. They had no therapeutic complications and advocated further use for true clinical evaluation. Lupus pernio is best treated with intensive applications of carbon dioxide. Gold, sodium thiosulfate, bismuth, tuberculin, and chaulmestrol have been used with no remarkable or consistent results. Curtis, Taylor, and Grekin (31) have reported favorable results from the oral administration of calciferol and dihydrotachysterol, working on the theory that increased excretion of phosphorus might affect the phospholipins.

### CASE REPORTS

*Case 1*—I. V., a 23-year-old Negro, was first seen in the out-patient clinic on 3 August 1948 complaining of dyspnea on exertion for 5 weeks. The patient had noted an increase in the dyspnea since 20 July 1948 when he developed an upper respiratory infection with a productive cough and greenish-yellow sputum.

A chest roentgenogram (fig. 1) showed a roughly rounded area of increased density extending from the right upper paravertebral area toward the right hilum in the region of the fourth, fifth, and sixth posterior interspaces and lying above the right first rib and upper border of the right second rib to the right of the midline. The lateral view showed the area of density to be in the anterior portion of the superior mediastinum without displacement of the trachea and esophagus. The remainder of the lung fields were clear. It was thought that the new growth of the mediastinum was probably of the lymphoblastoma group.

The patient was admitted to the Naval Hospital, Philadelphia, for further study on 10 August 1948. On admission his complaints were substernal pain, which began 7 August 1948, dyspnea on exertion, and a productive cough with greenish-yellow sputum.

The past and family histories were noncontributory.

*Physical examination*—The patient was a Negro in no apparent distress. His eyes, ears, nose, and throat were normal. There were several small lymph nodes which were nontender, not fixed or discrete in the right axilla, both right



Figure 1

and left inguinal regions, and left supraclavicular fossa. Examination of the lungs and heart revealed no abnormalities. Blood pressure was 130 systolic and 70 diastolic. Examination of the abdomen, genitalia, and extremities was essentially negative.

Bed rest and a regular diet was prescribed. On 20 August 1948 a biopsy of a lymph node from the left supraclavicular fossa was suggestive of sarcoidosis but tuberculosis could not be ruled out. A second biopsy of the right axillary node on 30 August 1948 when compared with the previous biopsy indicated sarcoidosis. Chest roentgenograms during hospitalization revealed no change from the previous films. Roentgenograms of the hands and feet revealed no rarefaction of bone.

Tuberculin test, blood Kahn test, and urinalysis were negative. Red blood cell count, 4,500,000; hemoglobin, 13 gm; white blood cell count was 4,700, and the differential was normal. The blood calcium, total serum protein, albumin, and globulin were normal.

The patient's course in the hospital was uneventful and his symptoms disappeared almost entirely with symptomatic therapy. The final diagnosis was sarcoidosis involving the paratracheal nodes and the subcutaneous lymph nodes.

**Case 2**—S. B., a 24-year-old Negro was admitted on 22 June 1948 complaining of dyspnea on exertion. He had no complaints until January 1946 while in the Army, at which time he had a cough, expectorating small amount of white mucus and moderate dyspnea. In February 1946 a chest roentgenogram showed lesions suggestive of tuberculosis, as a result, he was hospitalized. Studies at that time were negative for tuberculosis. He was discharged from the hospital

and from the Army after several months hospitalization. Sarcoidosis was the tentative diagnosis.

By November 1947, the dyspnea and cough had increased and he was again hospitalized. At that time chest roentgenograms revealed some increase in the pathologic lung changes with suggestion of cavity formation; the lesions were diffusely scattered throughout both lungs. Studies for evidence of tuberculosis were again negative. No positive results were obtained from tests for fungus disease. Bronchoscopic examination revealed no abnormalities. A biopsy of an enlarged lymph gland showed lymphadenitis. After several months he was discharged from the veterans' hospital with a tentative diagnosis of sarcoid disease.

The patient's symptoms continued. He had progressive weakness, weight loss, night sweats, and occasional chest pain. He was again hospitalized in June 1948, as he had lost 10 pounds in the previous 3 months and was unable to work. Treatment gave him no relief.

On admission in June 1948; the patient was a poorly nourished Negro and was in only slight distress. The positive physical findings were signs of consolidation throughout the right lung field and the upper portion of the left lung. There were several small discrete lymph nodes in the right supraclavicular region. No other abnormal findings were noted. His temperature (98.6° F.), pulse rate (96), respirations (18), and blood pressure (120/80) were normal.

Roentgenograms of the chest (fig 2), showed the entire right lung field up to the apex to be almost obliterated by patchy areas of homogenous densities.



Figure 2.

The upper left and left midlung fields were also obscured by similar patchy areas of homogenous density, but the parenchymal markings were visible. There was no evidence of abnormality in the region of the heart or great vessels.

White blood cell count on admission was 7,100; differential count showed 10 young and 62 old polymorphonuclears, 18 lymphocytes with 10 monocytes. Red blood cell counts, 4,200,000 with a hemoglobin of 9 gm. The urinalysis and blood Kahn test was negative. Repeated gastric washings and sputum analysis revealed no tubercle bacilli or fungi on smear or culture. Skin tests for tuberculosis, coccidioides and histoplasmosis showed no reaction. Sedimentation rate was 21 mm. in 30 minutes (Cutler) with a maximum of 5 mm. in 5 minutes; this remained elevated throughout hospitalization. The blood calcium, total serum protein, albumin, and globulin were within normal limits.

It was thought from roentgenographic findings and the past medical history, that the patient might have active tuberculosis. However, roentgenographic findings were also compatible with sarcoidosis. During his course in the hospital, his temperature ranged from 96° to 102° F. with an accompanying increase in pulse rate. With bed rest and symptomatic therapy improvement was noted; repeated roentgenograms and physical examination showed no change.

On 2 September 1948, a supraclavicular lymph node, 10 mm. in diameter, was removed for biopsy. On cut section it was grayish-pink, and histological examination revealed tissue characteristic of Boeck's sarcoid.

The patient was thoroughly examined for other evidence of sarcoid by an ophthalmologist and a dermatologist. No abnormalities were noted. He was discharged on 10 September 1948 with orders to return for periodic chest roentgenograms and physical examinations to determine the status of the sarcoidosis. Some dyspnea on exertion still persisted at the time of discharge.

*Case 3*—J. M. B., a 27-year-old white man was admitted on 15 March 1948 for study. Routine chest roentgenogram taken on 10 March 1948 (fig. 3) at his place of employment revealed an extensive mediastinal mass with widespread scattered areas of soft density throughout the upper chest, bilaterally. A chest roentgenogram taken on 20 January 1947 had been reported as negative. Apparently the patient had been perfectly healthy until January 1948 when he first complained of pain in the upper lumbar region bilaterally which radiated anteriorly along the lower costal margin. This pain lasted 1 week and had recurred several times. The patient had lost 16 pounds since the onset of the pain. Progressive weakness was noted in this same period. No dyspnea, cough, or other symptoms referable to the lungs were present.

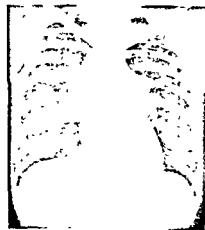


Figure 3.

Past and family histories were non-contributory.

Physical examination on admission revealed a tall, well-developed white man weighing 140 pounds. The ears, eyes, nose, and throat were essentially negative. Examination of the chest revealed no abnormal findings. The liver and spleen were not palpable and there was no tenderness in the abdomen. The genitalia and extremities

were normal. No lymphadenopathy was noted. His blood pressure, pulse rate, temperature, and respirations were normal. At this time it was thought that the mediastinal mass could be Hodgkin's disease, sarcoid, metastatic carcinoma, or tuberculosis.

Studies were begun to make the correct diagnosis. White blood cell count, 5,700 with a normal differential. Red blood cell count, 4,500,000 with hemoglobin 13 gm. Urinalysis and the blood Kahn test was negative. The total serum protein, albumin, globulin, and blood calcium was within normal limits. The sedimentation rate was slightly elevated. The tuberculin test was negative in 1:100 and 1:1000 dilution.

Roentgenograms of the chest were compatible with sarcoidosis. Roentgenograms of the hands and feet were negative. An intravenous urogram was within normal limits. An incidental finding at that time was spina bifida occulta of the first sacral segment with moderate demineralization of the lumbar spine.

Bronchoscopic examination on 1 April 1948 showed the carina to be greatly deformed and broadened. The entire area at the angle of the main bronchi was distorted and the lumina narrowed. It was thought that this was caused by a smooth swelling in the region of the mediastinum apparently spreading the bronchi. Papanicolaou stain of bronchial secretions was reported as negative for tumor cells.

No positive diagnosis could be established after the completion of the studies. It was believed that the patient's condition was probably Hodgkin's disease or sarcoidosis. He was seen by a group of consultants who thought that high voltage roentgen therapy to one side of the chest should be given to see the effect on the mediastinal mass and the lung. Dosage was to be 100 roentgen anteriorly and posteriorly to the right hemithorax on a 15 by 15 cm. field, and this was to be given at monthly intervals for 4 months and then a free interval of 4 months was to be allowed to lapse before a possible second course was to be instituted. This therapy was begun on 18 April 1948. He had made clinical improvement on symptomatic therapy and bed rest. There were no changes in the physical findings or chest roentgenograms on discharge.

The patient continued working while receiving therapy, until 9 August 1948, when he had an acute gastroenteritis. He was admitted to the hospital on 13 August 1948, still complaining of anorexia and vomiting. Vague lumbar pain had persisted since his previous admission. Physical examination at this time revealed no change from his last admission except for some mild epigastric tenderness. With diet and symptomatic therapy he soon recovered from this acute gastrointestinal upset.

On admission white blood cell count was 15,000 with an increase in polymorphonuclears; this was normal in 1 week. Tuberculin tests were still negative. Other laboratory tests were within normal limits.

A chest roentgenogram (following the last high voltage roentgen therapy) on 24 August 1948 showed a considerable decrease in the bilateral peribronchial



Figure 4.

density and adenopathy and the soft nodular involvement of the apical regions (fig. 4). Roentgenograms of the bones of the hands and feet revealed no change.

On 3 September 1948, a small discrete lymph node was noted in the right supraclavicular region. On 10 September 1948 a biopsy showed histologically typical Boeck's sarcoid. With the diagnosis established, the patient was discharged to be checked at frequent intervals by chest roentgenograms and physical examinations.

### SUMMARY

Three cases illustrating sarcoidosis involving the lungs and peripheral lymph nodes are presented; the diagnosis in each of these cases was confirmed by lymph node biopsy although the condition was suspected following chest roentgenograms. Sarcoidosis can involve almost any organ in the body and can present many different signs and symptoms, and should be kept in mind when making a differential diagnosis in certain symptom complexes.

### REFERENCES

1. BOECK, C. Multiple benign sarcoid of skin. *J. Cut. Dis.* 17: 543-550, 1899.
2. HUNTER, F. T. Hutchinson-Boeck's disease (generalized "sarcoidosis"); historical note and report of case with apparent cure. *New England J. Med.* 214: 346-352, Feb. 1936.
3. LONGCOPE, W. T. and PIERSON, J. W.: Boeck's sarcoid (sarcoidosis). *Bull. Johns Hopkins Hosp.* 60: 223-296, April 1937.
4. PINNER, M. Nodoseating tuberculosis, analysis of literature. *Am. Rev. Tuberc.* 37: 620-728, June 1938.
5. SCHAUIMANN, J.: Lymphogranulomatosis benigna in the light of prolonged clinical observations and autopsy findings. *Brit. J. Dermat.* 48: 339-446 Aug.-Sept. 1956.
6. BESNIER, E. Lupus pernio de la face; synovitis fongueuses (serofulo-tuberculeuses), symmetriques des extremités superieures. *Ann. de dermat. et syph.* 10: 333-336, 1889.
7. HANSSON, H. Besnier Boeck disease: review. *Brit. J. Tuberc.* 35: 88-113, April 1941.
8. BROcq, L. and FAUCHER, L. M. Langioloipode. *Ann. de dermat. et syph.* 4: 1-16, 1913.
9. SCHAUIMANN, J. Benign lymphogranuloma and its cutaneous manifestations. *Brit. J. Dermat.* 36: 515-544, Dec. 1924.
10. DARIER, J. and ROUSSY, G. Des sarcoides sous-cutanees. *Arch. de med. exper. et anat. path.* 18: 1-50, Jan. 1906.
11. GOLDREB, L. C. and COHEN, S.: Darier-Roussy sarcoid. *J. Med.* 19: 73-75, April 1938.
12. THOMAS, C. C.: Sarcoidosis. *Arch. Dermat. & Syph.* 47: 58-73, Jan. 1943.
13. REINER, D.: Boeck's sarcoid and systemic sarcoidosis (Besnier-Boeck-Schaumann disease); study of 35 cases. *Am. Rev. Tuberc.* 49: 289, April; 477, May 1944.
14. LEWIS, G. M.: Is Spiegler-Pendt sarcoid clinical or histologic entity? *Arch. Dermat. & Syph.* 31: 67-82, Jan. 1925.
15. KRAYS, E. J.: Sarcoidosis (Boeck-Besnier-Schaumann disease) as cause of pituitary syndrome. *J. Lab. & Clin. Med.* 28: 140-146, Nov. 1942.

16. LONGCOPE, W. T., and FISCHER, A. M.: Involvement of heart in sarcoidosis or Besnier-Boeck-Schaumann's disease. *J. Mt Sinai Hosp* 8: 784-797, 1942.
17. HEERFORDT, C. F.: Ueber eine Febris uveo-parotidea subchronica an der Glandula parotis und der Uvea des Auges lokalisiert und häufig mit Paresen cerebrospinaler Nerven kompliziert. *Arch f Opth* 20: 254-273, 1909.
18. WAGENER, H. P.: Ocular lesions in sarcoidosis of Boeck. *Am. J. M. Sc.* 203: 300-309, Feb. 1942.
19. MARTENSTEIN, H.: Sarcoid of Boeck and lupus pernio. *Arch. f. Dermat. u. Syph.* 147: 70-99, 1924
20. KING, D. S.: Sarcoid disease as revealed in the roentgenogram. *Am. J. Roentgenol* 45: 505-512, 1941.
21. BERNSTEIN, S. S., and SUSSMAN, M. L.: Thoracic manifestations of sarcoidosis. *Radiology* 44: 37-43, Jan. 1945
22. RUBIN, E. H., and RUBIN, M.: Diseases of Chest. W. B. Saunders Co., Philadelphia, Pa., 1947. pp. 506-512.
23. KIRKLIN, B. R., and MORTON, S. A.: Roentgenologic changes in sarcoid and related lesions. *Radiology* 16: 238-333, 1931.
24. ELLIS, F. A.: "Ostitis tuberculosa multiplex cystoides" (Jungling) in patients with true tuberculosis of skin. *Internat. Clin.* 4: 154-161, Dec. 1938
25. RUBIN, E. H., and PINNER, M.: Sarcoidosis; one case report and literature review of autopsied cases. *Am Rev. Tuberc.* 49: 146-169, Feb. 1944.
26. FOREIGN LETTER: Etiology of Besnier-Boeck's Disease. *J. A. M. A.* 105: 1205, Oct. 12, 1935.
27. SULZBERGER, M. B.: Sarcoid of Boeck (benign millary lupoid) and tuberculin anergy, report of case and general remarks. *Am Rev. Tuberc.* 28: 734-745, Dec. 1933.
28. LEIDER, M. L.: The Kveim test in sarcoidosis. *J. Invest. Dermat.* 10: 377-388, May 1948.
29. HARREL, F. T., and FISCHER, S.: Blood chemical changes in Boeck's sarcoid with particular reference to protein, calcium, phosphatase alone. *J. Clin. Investigation* 8: 687-698, Nov. 1939
30. POHLE, E. A.; PAUL, L. W.; and CLARK, E. A.: Roentgen therapy of Boeck's sarcoid. *Am. J. M. Sc.* 209: 503-513, April 1945.
31. CURTIS, A. C.; TAYLOR, H.; and GEFKIN, R. H.: Sarcoidosis, results of treatment with varying amounts of calciferol and dihydrotachysterol. *J. Invest. Dermat.* 9: 131-150, Sept. 1947.





# Carcinosarcoma of the Uterus

## Report of a Case

ALAN RAFTERY, *Lieutenant (MC) U. S. N.*<sup>1</sup>

EWING (1) devotes a section of his discussion of types of sarcoma to carcinosarcoma of the uterus, emphasizing errors in interpretation. In 1938, Saphir and Vass (2) reviewed 36 cases of carcinosarcoma occurring in the uterus and did not believe any of these to be true coexisting carcinoma and sarcoma, pointing out the common sources of error in interpretation. Since that review 2 cases have been reported in the English literature (3) (4). The following case is reported not only because of the rarity of the condition, but also to point out an error in interpretation, the antithesis of those emphasized in the references previously mentioned.

### CASE REPORT

A 62-year-old white woman was admitted in January 1948 complaining of slight vaginal bleeding of 3 months' duration. Cytologic study of vaginal smears showed malignant cells, probably of endometrial origin (fig 1). Tissue obtained by uterine curettement showed adenocarcinoma of the endometrium (fig 2).

She received 5,000 mg. hours of radium by intrauterine application. Six weeks following the completion of radiation a total hysterectomy was performed. The uterus showed a necrotic, boggy, papillary mass, 3.0×2.5×2.5 cm attached by a short pedicle, 1.2 cm in diameter, to the endometrium in the center of the anterior uterine wall. Sections from this mass and the adjacent uterine wall showed a few nests of degenerative-appearing epithelial cells embedded in degenerative stroma. The base of the stroma was cellular with extreme inflammatory cell infiltration and the stromal cells showed considerable radiation effect. The postoperative course was uneventful and the patient was discharged.

In August 1948 she was readmitted complaining of a recurrence of vaginal bleeding. On examination, a large soft hemorrhagic mass was found in the vaginal vault; on biopsy this was found to be an anaplastic sarcoma. At this time sections of the original specimen and others from the uterus were carefully reviewed. The stromal reaction noted in the original reports was interpreted at this time as sarcoma and the diagnosis was changed to carcinosarcoma of the uterus.

The tumor in the vaginal vault did not respond to high-voltage roentgen therapy and progressively enlarged. Her course was steadily downhill; partial bowel and ureteral obstruction and a rectovesicovaginal fistula occurred and the patient died 9 January 1949.

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Figure 1.—Malignant cells in original vaginal smear.  $\times 400$ .



Figure 2.—Original endometrial biopsy.  $\times 250$ .

At autopsy the pelvis was found to be filled with a huge necrotic tumor mass that involved the pelvic structure and displaced the urinary bladder. The rectum and bladder opened into a cavity 22 cm. in circumference lined on one border by recognizable vaginal mucosa. Numerous sections taken from the mass showed a picture of an anaplastic sarcoma characterized by cellular pleomorphism, lack of differentiation, and broad areas of necrosis (fig 3). A single tumor nodule, in the lower lobe of the right lung was found; histologic examination showed a well-differentiated metastatic adenocarcinoma, resembling the adenocarcinoma of the uterus seen in the first biopsy (fig 4).

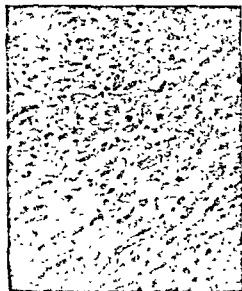


Figure 3.—Pelvic sarcoma at autopsy.  $\times 250$ .

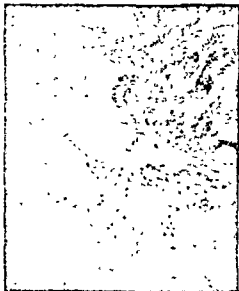


Figure 4.—Metastatic adenocarcinoma, lower lobe, right lung.  $\times 125$ .

## COMMENT

It is believed that the intrauterine carcinoma was controlled by the initial radium therapy, but the radioresistant sarcoma survived and gave rise to the "dropped" metastasis in the vaginal vault. The pulmonary metastasis probably occurred prior to instituting therapy.

## REFERENCES

1. EWING, J. *Neoplastic Diseases* 3d edition W B Saunders Co., Philadelphia, Pa., 1928
2. SAPHIR, O., and VASS, A.: *Am J Cancer* 33: 331 1938
3. DIXON, C. F., and DOCKERTY, M. B.: *Am J Obst. & Gynec.* 39: 128, 1940.
4. HOFFMAN, B. J.: *Am. J. Obst. & Gynec.* 40: 289, 1940



AN ARTIFICIAL HEART OR CARDIOPULMONARY MACHINE; Performance in Animals, by V. O. Bjork. From the Surgical Clinic, Sabatsberg Hospital, Stockholm, Sweden. *Lancet* 2: 491-493 Sept 25, 1948.

Bjork reports that in 1935 Crafoord found that it was possible to suspend the flow of blood to all the organs except the brain for a considerable period of time without damaging them. In 33 patients undergoing operation for patent ductus arteriosus he double clamped the aorta just below the point where the left subclavian artery arises for from 10 to 27 minutes without producing any disturbance in the internal organs of these patients.

In 1946 Crafoord and Anderson constructed an artificial heart which Bjork used in the dog. He clamped both the inferior and superior vena cavae for 33 minutes rendering the heart bloodless but maintaining the blood flow to the brain with the artificial heart. The dog survived with no evident signs of organic damage. They state that in order to perform a bloodless intercaval operation it is only necessary to maintain an adequate circulation of oxygenated blood through the brain and to provide for maintenance of the blood concentrations within normal limits.

The apparatus consists of a horizontal cylinder containing a partition trough in the lower part of the cylinder. The blood flows alternately over successive partitions and through the cylinders; runs a central axle bearing 40 to 60 rhodium plated stainless steel disks which dip into the blood and as they rotate expose films of blood to the oxygen in the cylinder.—*Abstract.*



# Disinsertion of the Biceps Brachii

## Report of a Case

JOHN S. THIEMEYER, JR., *Commander (MC) U. S. N.*<sup>1</sup>

**D**ISRUPTION of the continuity of the biceps brachii muscle is common among persons such as laborers and athletes, and others performing strenuous muscular exertions. Commonly, the disruption occurs in the continuity of the long head.

Gilcrest (1) reported a series of 100 cases in which rupture in 20 occurred in the upper musculotendinous junction and in 56 involved the long head directly as follows: rupture of long head, complete in 3; rupture of long head, partial in 5; rupture of tendon of long head (intra-articular portion) in 34; and rupture of tendon of long head (extra-articular portion) in 14. There were also 2 with rupture of lower musculotendinous junction; 1 with rupture of lower tendon itself; and 3 with rupture of lower tendon, lower attachment.

Thus, there were only 6 cases in which the lower tendon was involved and only 3 cases in which the lower attachment was involved.

Watson-Jones (2) states "although the distal tendon is exposed to similar muscle strains, it is not subject to pathological degenerative changes and less than 40 cases of ruptures or avulsion have been recorded."

Milch (3) reported a case of "disinsertion of the biceps brachii" in April 1948 which presented the typical "lumping" of the muscle at the upper arm which occurs in disinsertion of the distal portion of the muscle. This case was operated upon and the muscle reinserted by means of a fascial graft.

### CASE REPORT

A. J. P., a 43-year-old man, had pain of the right arm following lifting of a heavy table. A "tearing" sensation occurred at the same time and the patient felt as though he had "torn his shirt." Upon looking at his arm he noticed the "muscle all bunched up" at the upper end of his arm and he became alarmed.

His past and family histories revealed no significant findings and a complete blood count and urinalysis was within normal limits. The blood Kahn

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*Figure 1.—Depression above the antecubital fossa and massing of the biceps muscle in the anterior-superior arm. This photograph taken when patient was anesthetized does not show the marked "bunching" of the muscle which was seen on admission.*

an "annoying" sensation but not a painful one and a firm, freely-movable mass about the size of a 25-cent piece, which was believed to be the distal end of the biceps tendon was palpated at the distal pole of the mass. At surgery this proved to be the case.

Shoulder motion was full and painless in all planes.

Surgery was performed the following morning. Under a pneumatic tourniquet a bayonet or Z incision was made with the proximal arm along the mesial surface of the arm, the transverse arm crossing the antecubital fossa and the distal arm along the upper one-third of the lateral forearm.

Upon dissecting through the sheath of the biceps brachii proximally, a moderate semiorganized blood clot was encountered and the muscle itself was seen to be moderately hemorrhagic and retracted. The distal tendon was coiled in the lower pole of the sheath cavity and was found to be freely movable. A clamp was placed over the end of the tendon and it was withdrawn from the wound (fig. 2).

Dissection was then carried down into the forearm and the site of attachment of the biceps brachii to the ulna was exposed, showing an irregular, fibrous tissue surface from which the tendon had become disinserted. A drill hole was passed through the ulna at this point and the biceps tendon passed down through its channel and secured to its normal insertion by No. 1 braided silk sutures. In addition several silk No. 00 sutures secured the tendon to the periosteum. The frayed tissue of the remnants of the lacerated fibers were sutured together. The wound was then closed in an anatomical manner and an ace bandage and sheet wadding dressing applied from knuckle-line to upper arm. Over this dressing a posterior molded splint was placed with the elbow in maximum flexion.

The patient remained in the posterior splint for a period of 1 month following which progressive return of function was carried out.

test was negative. Roentgenograms of the entire arm and forearm showed no evidence of pathologic bone changes.

*Physical examination.* The patient was a robust, well-muscled, white man not appearing in acute distress. The right arm showed massing of the biceps muscle in the anterior-superior surface of the arm with a definite depression above the antecubital fossa (fig. 1).

Flexion and extension at the elbow joint was full actively but flexion was weak and painful against resistance. Active pronation and supination were weak, although nonpainful.

Palpation of the muscle mass elicited



*Figure 2.—Surgical exposure of disinsertion of the biceps brachii from the ulna insertion.*

## REFERENCES

1. GILCREST, E. L.: Rupture of long head of biceps brachii Surg, Gynec & Obst. 58: 331, 1934
2. WATSON-JONES, R.: Fractures and Joint Injuries. 3d edition Williams & Wilkins Co, Baltimore, Md, 1946 p 420
3. MILCH, H.: Disinsertion of biceps brachii Bull Hosp Joint Dis 9: April 1948.



INTRA-ARTERIAL BLOOD TRANSFUSION, by Sam F. Seeley, *Colonel, MC, U. S. A.* American Journal of Surgery 78: 733-735, Nov. 1949.

One of the most important considerations in the prevention of shock or the treatment of circulatory collapse is the appraisal of the disparity between vascular volume and the capacity of the vascular system. Because of the difficulties encountered in estimating the degree of depletion of the vascular volume, work on the intra-arterial administration of blood was begun in 1939. If a reservoir containing blood is attached to a major artery the supply of blood from the reservoir may be regulated to maintain normal blood pressure and to replace blood loss from hemorrhage.

Blood has been administered by way of the aorta, femoral, dorsalis pedis, brachial, and radial arteries. No damage to the arteries has been reported as a result of insertion of the needle. The hazard involved in the administration of blood of low oxygen content within an artery in the distal extremity may be overcome either by oxygenation of the transfused blood or by the introduction of a catheter of sufficient length into the radial artery to deliver the blood at or near the aortic arch. Attempts to oxygenate blood so far have not been successful. Arterial administration of blood is of value in (a) replacing rapidly large quantities of blood in cases of severe hemorrhage; (b) replacing sufficient blood to maintain blood pressure levels in cases of concealed hemorrhage; (c) maintaining normal blood pressure levels in the presence of impending collapse caused by trauma or hemorrhage so that surgery may be performed promptly when indicated; (d) perfusing patent coronary vessels at a blood pressure of any desired level, in cases of coronary infarction; (e) reducing blood pressure, to any desired level consistent with tissue oxygenation, during the stage of operation where serious hemorrhage may be expected with the subsequent return of blood to the circulation after the stage of danger has passed; and (f) producing a blood pressure level in the distal aorta equal to that of the proximal aorta prior to the release of clamps after resection of the aorta in cases of coarctation.—*Abstract.*



# Tetraethylammonium Chloride in Pain

VICTOR M. SHOLOS, *M.D.*<sup>1</sup>

LEWIS W. BLUMLE, JR., *Captain, MC U. S. A.*<sup>2</sup>

**P**AIN following needle aspiration of material for liver biopsy has not seemed to be a serious complication nor a contra-indication to the use of this diagnostic method. Nevertheless, pain of various intensities is reported to follow removal of a specimen for liver biopsy in as many as 80 percent of cases (1). This is particularly true when the transthoracic approach is used. Indeed, this has led many clinics to the routine use of demerol or morphine as a preoperative measure to minimize possible discomfort to the patient (2). Since the patients selected for liver biopsy are likely to be overly sensitive to opiates or barbiturates, it is desirable to use other means of analgesia, particularly in the small group of patients who experience severe pain following the operative procedure.

At the Army Hepatic and Metabolic Center specimens for liver biopsy are obtained through the thorax with the Vim Silverman needle. In this series three sites of pain have been noted even with the use of demerol preoperatively. First, pain in the epigastrium or right upper abdominal quadrant may be noted immediately with insertion of the needle. This has been described as dull and usually lasts about 2 hours, but may persist for a longer period. It may be associated with nausea lasting for a few minutes to 2 hours. This pain, even when persistent, is usually a source of only mild complaints by the patient. Second, a rather common and distressing pain has its onset from a few minutes to an hour following needling. This is a sharp, shooting, pleuritic pain aggravated by inspiration. It is usually located at the site of needle insertion and may radiate through to the back or upward to the right shoulder and when present the patient's breathing is shallow and he splints his right hemithorax. This pain may be so severe that the patient is able to speak only in a

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grunting manner and he becomes extremely apprehensive because of his inability to fill his lungs with air. It is this type of pain for which some form of relief is desirable. The third and least common site of pain in this series has been the right shoulder pain; usually it is mild and referred to the right supraclavicular fossa. This pain has never been noted in the absence of the pleuritic pain although it is not necessarily present with the pleuritic pain.

Tetraethylammonium chloride was used at this hospital for the relief of pleuritic pain secondary to pulmonary infarction and it was believed that a trial with this drug was warranted when pleuritic pain occurred after obtaining a specimen for liver biopsy is obtained.

We have used tetraethylammonium chloride for the relief of pain in 28 patients who had sufficient pain to require some form of analgesia (table 1). One of these was given the drug prophylactically. In 23 patients there was at least 50 percent relief from pain with the intravenous administration of from 75 to 200 mg. of the drug. Seven experienced temporary relief and required a second injection to gain permanent relief. One patient obtained less than 50 percent relief from pain, but with a second administration attained 90 percent relief

TABLE 1—Results with tetraethylammonium for relief of postbiopsy pain

Patient	Age	First dose	Percent of relief	Duration of relief	Second dose	Percent of relief	Duration of relief	Comment
		Mg			Mg			
1.....	25	200	80	15 minutes	200	00	Permanent	Dramatic relief Relief within 2 minutes of injection Relief within 1 minute of injection. Severe pain with apprehension Dramatic relief
2.....	22	200	90	Permanent				
3.....	30	200	100	24 hours	200	100	Permanent	
4.....	27	200	85	Permanent				
5.....	21	200	90	do				
6.....	56	200	40	30 minutes	NR			
7.....	23	200	40	do	200	90	Permanent	
8.....	53	200	85	Permanent				
9.....	29	200	0		NR			
10.....	36	200	40	Permanent				
11.....	58	75	60		NR			Within 30 minutes obtained 100 percent permanent relief.
12.....	41	200	95	Permanent				
13.....	22	200	100	30 minutes	200	70	Permanent	
14.....	49	200	65	Permanent				
15.....	21	200	75	5 minutes	NR			Second dose not required because cycle of pain and breathholding was interrupted
16.....	20	200	100	Permanent				
17.....	21	200	50	do				
18.....	21	200	75	do				
19.....	42	200	95	do				
20.....	31	200	75	do				
21.....	36	200	50	1 hour	200	40	2 hours	Third dose of 200 mg. gave 30 percent permanent relief
22.....	28	200	50	3 hours	200	50	Permanent	
23.....	28	200	75	Permanent				
24.....	27	200	50	5 minutes	NR			Second dose not required because cycle of pain and breathholding was interrupted
25.....	31	200	90	Permanent				
26.....	21	175	60	do				
27.....	43	200	75	do				
28.....	32	200	90	5 hours	200	70	Permanent	

<sup>1</sup> Given prophylactically 10 minutes prior to biopsy.

<sup>2</sup> Estimated percent less pain than on previous biopsy.

<sup>3</sup> NR—Not repeated.



which was permanent. The patient to whom the drug was given prophylactically had considerable pleuritic right shoulder and abdominal pain following a previous removal of a specimen for liver biopsy. He was given no preoperative medication except 200 mg. of tetraethylammonium chloride intravenously 10 minutes prior to the procedure. His preparation consisted only of infiltration of the skin at the needle insertion site with 1 percent procaine. No procaine was used in the subcutaneous tissues, the pleura, or the liver capsule. The only complaint was a dull midabdominal pain during the procedure and later only mild abdominal pains lasting about 2 hours. Since it is common to note such moderate pain without the use of a special medication, the exact role of the drug in preventing pain in this patient is inconclusive. Only one patient of this series obtained no relief.

The effectiveness of this drug is not limited to the extent of relief experienced by the patient nor to the permanence of the relief. With the onset of the sharp, shooting pain of induced pleuritis, the patient immobilizes his chest and holds his breath in an attempt to alleviate his discomfort. At some point, however, he must inspire and with this he again feels pain. The relief from this type of pain with tetraethylammonium chloride is rapid and dramatic. It often occurs within 1 minute of the time of injection. The patient is then able to inspire with minimal or no pain. Thus the cycle of pain followed by breathholding is stopped and the patient can regulate his breathing with no discomfort.

#### DISCUSSION

The use of tetraethylammonium chloride to relieve pain was described by Caller et al. (4). Visceral and anginal pain have also been alleviated with this drug (5). Other than the experience recorded by Israel et al. (3), we are not aware of any reports of the relief of pleuritic pain with tetraethylammonium chloride. In our series the pain alleviated has been mainly in the pleura and right shoulder. Little effect has been noted on the dull abdominal discomfort produced by the procedure. This drug was immediately effective in relieving the nausea in four patients. This is probably related to the reduction of gastric motility by tetraethylammonium chloride (6). In our series we have noted no adverse effects from this drug. The dose used has been well below the levels at which toxic manifestations are recorded (7). This, plus the fact that most patients in this series were not over 40 years of age, may account for the absence of complications. The toxic manifestations and contra-indications of this drug have been described by Birchall et al. (8) and should not be disregarded particularly if there is any evidence of excessive bleeding. It is not intended that the drug should be used routinely, but rather

that it should be reserved for the patient with distressing symptoms following removal of a specimen for liver biopsy.

### SUMMARY

The intravenous administration of 200 mg. of tetraethylammonium chloride gave relief of pain following removal of a specimen for liver biopsy in 26 of 27 patients. Suggestive evidence is given for the prevention of pain with the use of the drug prophylactically in 1 patient. Tetraethylammonium chloride would seem to be a desirable drug to use for this purpose because of the dramatic relief from pain and nausea and because of its lack of side effects.

### REFERENCES

1. KUMPE, C. W.; GALL, E. A.; SCHIFF, L.; MILLIE, W. E.; SAFDI, S. A.; and STEINBERG, H. H.: Needle biopsy of liver. *Gastroenterology* 9: 672-681, Dec. 1947.
2. HOFFBAUER, F. W.: Needle biopsy of liver. *J. A. M. A.* 134: 666-670, June 21, 1947.
3. ISRAEL, H. L.; KEETER, E. B.; URBACH, F. E.; and WILLIS, W. D.: Relief of pleuritic pain by tetraethylammonium chloride. *New England J. Med.* 241: 738-740, Nov. 10, 1949.
4. CALLER, F. A.; CAMPBELL, K. N.; BERRY, R. E. L.; SUTLER, M. R.; LYONS, R. H.; and MOE, G. K.: Tetraethylammonium as adjunct in treatment of peripheral vascular disease and other painful states. *Ann. Surg.* 125: 729-755, June 1947.
5. LYONS, R. H.; MOE, G. K.; NFLIGH, R. B.; HOORLER, S. W.; CAMPBELL, K. N.; BERRY, R. E. L.; and RENICK, B. R.: Effects of blockade of autonomic ganglia in man with tetraethylammonium. *Am. J. M. Sc.* 213: 315-323, March 1947.
6. DOBBS, D. C.; OUID, C. L.; and DAILEY, M. E.: Effect of tetraethylammonium chloride on gastric motility in man. *Gastroenterology* 10: 1007-1009, June 1948.
7. FRANK, A. R.; HAMMARSTROM, S.; LAGERLOF, H.; WIRKE, L.; BJORKENSHJIM, G.; HOLMGRAN, A.; and LARSSON, Y.: Effect of tetraethylammonium in arterial hypertension. *Am. J. M.* 5: 807-814, Dec. 1948.
8. BIRCHALL, R.; TAYLOR, R. D.; LOWENSTEIN, B. E.; and PAGE, I. H.: Clinical studies of pharmacologic effects of tetraethylammonium chloride in hypertensive persons made in attempt to select patients suitable for lumbar sympathectomy and ganglionectomy. *Am. J. M. Sc.* 213: 572-578, May 1947.



# Recurrent Ectopic Pregnancy

## Report of a Case

JOHN LINGENFELDER, *Lieutenant (MC) U S N<sup>1</sup>*

**R**ECURRENT ectopic pregnancies are unusual and occur in about 4 or 5 percent (1) (2) of cases in women who are able to conceive following operation for that condition. Recurrent ectopic pregnancy in the site of a previous salpingo-oophorectomy for tubal pregnancy is, however, exceedingly rare. A survey of the available literature discloses 37 previous cases of this unusual and interesting condition. In 1926 Hasselblatt (3) made an exhaustive survey and was able to report 19 previous cases and added 2 cases. In 1935 Deutsch and Clahr (4) found 8 other case reports in the literature and reported a new case of their own. Since that time Bartlett (5), Casler (6), Forman (7), Ballentyne et al. (8), Gee (9), and Frankel (10) have all reported additional cases.

### CASE REPORT

M R N, a 30-year-old white gravida III, para I, was admitted on 13 June 1947. Her chief complaints were cramps in the left lower quadrant of the abdomen for 3 days and weakness and fainting during the preceding 12 hours. The initial onset of symptoms had followed coitus. Her previous history included a left salpingo-oophorectomy in 1939 for ruptured left ectopic pregnancy. At this time the surgeon also performed a right salpingostomy and uterine suspension. In 1942 another uterine suspension was performed and the following year in 1943 the patient had a spontaneous 3 month abortion. In October 1946 the patient had a full term normal delivery of a viable male infant.

She stated that her last menstrual period occurred on 6 May 1947 and was normal in character and flow. After the onset of her first symptoms she consulted a physician who shortly before entry into the hospital performed a pelvic examination which brought on an acute exacerbation of pain and faintness. She was then transferred to the hospital with a presumptive diagnosis of ruptured ectopic pregnancy. Upon admission, she was in obvious distress and in early shock, blood pressure was 90/60 and the pulse rate was 112. Examination at that time revealed tenderness and muscle guarding in both lower quadrants, more severe on the left. On pelvic examination an indefinite but extremely tender mass in the left adnexal region was felt. The cervix was softened and slightly cyanotic. A cul-de-sac aspiration revealed bright red blood. Plasma infusion was begun prior to the cross-matching for transfusion. A diagnosis of ruptured ectopic pregnancy was believed certain.

<sup>1</sup> U S Naval Hospital Guam, M I

*Operation.*—Gross blood and clots were noted on opening the peritoneum. The left uterine cornu was seen bleeding briskly from what appeared to be a ruptured pea-sized bleb at the apparent site of the previously excised tube. This entire area was removed with a cuneiform excision and the defect of the uterus was closed with interrupted chromic catgut sutures. Inspection of the right tube and ovary showed normal-appearing organs. The abdomen was closed in layers. Transfusion of 500 cc of citrated whole blood was started just prior to completion of surgery, at which time the patient had received 700 cc of plasma. The patient's condition was much improved following surgery. Her postoperative course was uneventful.

#### *Pathologist's report*

*Gross examination.*—Specimen consists of a wedge-shaped piece of tissue measuring  $0.75 \times 1.5 \times 1.5$  cm. On one aspect there is a bleblike cyst measuring 0.5 cm in diameter and which is apparently ruptured. The cyst has a hemorrhagic appearance.

*Microscopic examination.*—The section reveals smooth uterine muscle invaded in areas by hyperchromatic syncytial cells. There is also an area of hemorrhage with chorionic villi within it. These villi have two layers of cells. Within the myometrial portion of the section there is a cavity lined by cuboidal epithelium resembling the epithelial lining of the interstitial part of the uterus.

*Diagnosis.*—Ectopic pregnancy in stump of previously excised left fallopian tube.

#### DISCUSSION

There are several interesting aspects to this case aside from the rarity of the condition itself. First, interstitial ectopic pregnancies usually progress to a much later stage of development before rupture occurs and in this case, as in Richardson's (11) case, one must postulate that implantation occurred in the most superficial part of the remaining portion of the tube for rupture to occur so early. Another interesting point is that the patient had had two subsequent pregnancies after the first salpingo-oophorectomy for tubal pregnancy, and this would indicate that the remaining right tube was patent. The patient did not give the usual history of preceding sterility for several years; her last pregnancy had terminated only 8 months before with a full-term normal delivery.

Since only the right ovary remained at the time of this accident, it is evident that a transmigration of the ovum occurred with implantation in the opposite tube. As to the mode of transmigration there are three possibilities:

(a) Internal migration of an ovum which had been fertilized in the right tube, across the fundus and then up into the partially or completely canalized cornu on the left side.

(b) External migration of the ovum and implantation in a pocket of the tube on the left side, which had regenerated or recanalized and through which sperm had migrated to fertilize the ovum prior to nidation.

(c) External migration of an ovum which was fertilized by spermatozoa which had ascended through patent right tube with nidation occurring in a pocket of the tube at the site of the previous operation.

The first explanation in this case would seem to be the easiest mechanically, and there is some evidence (Forman (7)) to indicate internal migration can occur. Most writers (4) (11) (12) believe external migration to be the usual method of implantation, and this cannot be ruled out in this case.

The treatment in this case was cornual excision which would theoretically offer the most assurance against recurrence. A wedge excision in all salpingectomies would seem to be indicated if not offering too many technical difficulties at operation. While cornual excision is probably the surest method of preventing recurrence, there are instances in which this has failed (Nache (13) quoted by Ballentyne et al. (8)) Labry (14) in discussing LeClere's (15) paper stated that he believes that occasionally in tubal abortion the tube may be tamponaded after expression of the pregnancy and the tube then left in situ. In the same paper Cotte (16) expresses the opinion that the corresponding ovary should be removed with the pregnant tube in order to insure that ova dropped from that side would not be wasted by being unused. The latter would appear to be an extreme viewpoint in that it is known that external transmigration can occur, further ovarian tissue should be conserved. The view of conserving the tube in tubal abortion would seem to entail immediate as well as future hazard from recurrence and from a practical viewpoint can seldom even be considered.

#### REFERENCES

1. CACCIA J P. *Semana méd* 47: 583, 1940
2. ESCOBAR, P C. *Rev Clin de São Paulo* 8: 133, 1942
3. HASSFELATT, R. Quoted by Deutsch and Clahe (4)
4. DEUTSCH, J. and CLAHE, J. *Am J Obst & Gynec* 29: 889 1935
5. BARTLETT R W. *Am J Obst & Gynec* 38: 718, 1931
6. CASPER, D B. In discussion of article by Schauffer, G C, and Wynli, F O. *Am J Obst & Gynec* 42: 786, 1941.
7. FORMAN, I. *Am J Obst & Gynec* 38: 344, 1939
8. BALLENTYNE, E M; MURRAY, K, and FRASER, R J. *Canad M A J* 43: 799, 1940
9. GEE, S. *Brit M J* 1: 841, 1945
10. FRANKEL, A M. *Am J Obst & Gynec* 56: 574, 1948.
11. RICHARDSON, L A. *Lancet* 2: 296, 1930
12. DERRICK, E. *New England J. Med.* 216: 654 1939
13. NACHE, W. Quoted by Ballentyne et al (8)
14. LABRY, R. In comment on paper by F P. LeClere (15).
15. LECLERE F P. *Lyon chir* 37: 163 1941-1942.
16. COTTE, G. In comment on paper by F. P. LeClere (15)
17. KASER, O. *Monatschr f Geburtsh u Gynak* 115: 7, 1943.

# Thrombocytopenic Purpura

## Discussion and Report of a Case

FENIMORE T. JOHNSON, *Lieutenant (MC) U S N*<sup>1</sup>

THE tendency to bleed into the skin and from the mucous membranes is known as "purpura." As a term it has "no more pathological significance than has the term, anemia" (1).

Any classification of hemorrhagic diseases is unsatisfactory because of our incomplete knowledge of the fundamental processes involved, but, in general, three main types may be distinguished: (a) those associated with a disturbance in one or more of the chemical factors involved in clotting; (b) those resulting from deficiency or defect of the blood platelets; and (c) those secondary to an alteration in the capillary walls.

### ETIOLOGY

Many theories have been advanced concerning the cause of thrombocytopenia (3). Kaznelson believed that the platelets were destroyed in the spleen in excessive numbers, and more rapidly than normal. Frank postulated that a substance is formed in the spleen which inhibits platelet formation from the megakaryocytes. It is possible that the primary disorder is a defect in the capillaries, permitting blood to escape through their walls. According to this view, the platelets are used up in attempt to close up the multiple vascular defects.

The importance of a capillary defect as a factor in the etiology of purpura is indicated by clinical experience. As pointed out by Winthrope (3), hemorrhage is not always closely correlated with the degree of thrombocytopenia and purpura does develop when capillaries are deliberately damaged, as in the tourniquet test.

Thrombocytopenic purpura may be either primary or secondary. The latter is by far the more common (3). It may be caused by infections, either current or recent, by drug intoxications, or by a disease causing depression of the bone marrow (3).

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Primary thrombocytopenic purpura rarely occurs in more than one member of a family, although a family history of bleeding tendency is not unusual (4). Women are affected more often than men, young children more often than older children, and Negroes uncommonly (4). A predisposition to allergic manifestations, especially asthma, has been noted in some patients (5).

### DIAGNOSIS

The usual duration of this disease is from 3 to 18 months (6). A slightly enlarged spleen is palpated in about one-third of the cases; general lymph node enlargement is not found (3). This is the most common form of the disease. There are two other forms (7): the first, and most serious, although fortunately the rarest, is the fulminating form: the first attack may prove fatal, and hemorrhage may be widespread. In addition to the visible bleeding, the patient may have hidden hemorrhage and the central nervous system may be involved. Abdominal pain may accompany gastrointestinal bleeding. The other, a chronic, recurrent form, is characterized by periodic episodes of hemorrhage of varying severity, with intervals of apparently perfect health during which the bleeding tendency lessens although the platelet count remains about the same low level.

Thrombocytopenia may occur with or without noticeable symptoms of free bleeding, or even of prolongation of the bleeding time. Spontaneous bleeding usually does not occur unless the platelet count is below 60,000 cu. mm. (3).

Primary thrombocytopenic purpura is diagnosed as such only by exclusion of all the known underlying causes for platelet deficiency. With increasing skill and further investigation, the diagnosis of primary thrombocytopenic purpura becomes less common.

The hemostatic properties of the platelets are well known. By their agglutinative properties they can form a plug which serves directly to seal an injured blood vessel until a permanent clot is produced. Upon their subsequent dissolution a substance is released which may initiate the coagulation process. Only a small number of platelets are required for this. The excess not used brings about retraction of the clot, known as syneresis, by some mechanism not known at present. Syneresis is important in hemostasis because it causes the blood vessel walls to come together. When there is no platelet excess, blood clotted in a test tube fails to retract.

Capillary resistance may be measured by the tourniquet test. By compressing the arm or leg with a sphygmomanometer cuff midway between the systolic and diastolic levels for 5 minutes, petechiae may be made to appear below the point of compression in numbers proportional to the fragility of the capillaries. A more informative test

is the suction test, in which suction is applied on the forearm and the negative pressure recorded at which petechiae appear. Normally this ranges between -200 and -300 mm. of mercury (2).

In children, great difficulty is encountered in differentiating this condition from leukopenic leukemia, for thrombocytopenic purpura is almost invariably present, and is often the first indication of leukemia (6). Bone marrow biopsies are helpful in eliminating this diagnosis.

### TREATMENT

The natural tendency in acute phases or exacerbations of idiopathic thrombocytopenic purpura is toward improvement (3). Treatment, therefore, should consist of bed rest, general nursing care, appropriate diet, and antianemic treatment. There is no evidence that any of the vitamins are of specific value (7). If there has been much bleeding and shock is imminent, blood transfusions are necessary. Small transfusions at intervals of 2 to 7 days have been said to stimulate blood formation and to supply platelets (3).

The popular conception that splenectomy is an infallible remedy can be challenged because the varied course of the disease makes adequate appraisal of the effects of surgery practically impossible. There are, however, indications for surgery, such as severe bleeding which fails to subside after repeated transfusion, frequent recurrences which jeopardize growth or development or the social or economic status of the patient, the occurrence of the disease in women past puberty because of the possibility of serious bleeding at menstruation or during pregnancy (4).

### CASE REPORT

A 2-year-old white boy was admitted because of petechiae and ecchymoses widely scattered over the cutaneous surface of his body and, to a lesser extent in the mucous membranes. When these appeared, suddenly, 4 days prior to admission, he was otherwise perfectly well except for a mild upper respiratory infection. He had no lymphadenopathy, but the spleen was palpable 3 cm. below the left costal margin. The day following admission he had several moderately severe nosebleeds.

On admission, his bleeding time was  $9\frac{1}{2}$  minutes, and no clot retraction occurred after 24 hours. This suggested a thrombocytopenia; confirmed by a platelet count of 45,000 per cu. mm. The clotting time was normal (7 minutes). The tourniquet test was positive. There was no history of allergy. However, while in the hospital he had a contact dermatitis from merthiolate over the site where a specimen of bone marrow was taken for biopsy. His father has seasonal hay fever. His mother has hives when exposed to temperature variations. One brother had an intestinal allergy to milk, both human and bovine, and was raised on a soybean milk substitute the first 2 years of life. One sister has had one attack of asthma.

On the day preceding the onset of his symptoms, this patient had received nose drops containing tyrothricin. He had had no other medications for several months.



Following the epistaxis on the second hospital day, a transfusion of 140 cc. of citrated whole blood was administered. By the next day the bleeding time had dropped to  $4\frac{1}{2}$  minutes, and the platelet count rose to 144 000. A second transfusion of 240 cc. was then given, and the bleeding time dropped to 2 minutes. Seventeen days after onset the purpura completely disappeared, and the spleen was barely palpable.

This patient has been observed for 19 months, and has shown no signs of recurrence.

#### SUMMARY

Thrombocytopenic purpura occurs because of some factor which brings about a reduction of the number of blood platelets. It appears in an acute or chronic form and is characterized by bleeding into the skin, subcutaneous tissues, and internal organs. Spontaneous recovery is the rule and drugs are of no value.

A résumé of the initiating factors, signs, and symptoms, and the treatment of thrombocytopenic purpura is presented.

#### REFERENCES

1. BOYD, W.: Pathology of Internal Disease. 4th edition. Lea & Febiger, Philadelphia, Pa., 1944. p. 571.
2. ELLIOT, R. H. E.: Suction test for capillary resistance in thrombocytopenic purpura. *J. A. M. A.* 110: 1177, 1938.
3. WINTROBE, M. M.: Clinical Hematology. 2d edition. Lea & Febiger, Philadelphia, Pa., 1946. pp. 615-627.
4. WINTROBE, M. M.; HARRIS, E. M.; and THOMAS, C. B.: Purpura haemorrhagica with special reference to course and treatment. *J. A. M. A.* 109: 1170-1176, Oct. 9, 1937.
5. THOMAS, J. W., and FOLSYTHE, J. R.: Allergy in relation to purpura. *J. Lab. & Clin. Med.* 26: 1105, 1941.
6. NELSON, W. E.: Textbook of Pediatrics. W. B. Saunders Co., Philadelphia, Pa., 1945. pp. 907-910.
7. ROSENTHAL, N.: Course and treatment of thrombopenic purpura. *J. A. M. A.* 112: 101-106, Jan. 14, 1939.



# Treatment of Bronchial Asthma With Psychotherapy

## Report of a Case

ARNOLD B. SCHEIDEL, *Captain, MC, A. U. S.*<sup>1</sup>

THE relationship between bronchial asthma and allergy has been familiar since the discovery of allergens. It has been found that the person with asthma often is not only sensitive to a specific substance, removal of which exerts a therapeutic effect on the illness, but also that he often presents a history of other allergic manifestations such as eczema, urticaria, or hay fever—a true allergic diathesis. The importance of emotional factors in the causation of asthma has gained acceptance more recently and has followed the work of a small number of investigators, among them Salter, Rogerson, Obendorf, French, Alexander, et al. It had been found that, not unlike the allergic diathesis in asthma, there also seems to be a rather typical emotional diathesis—a constellation of environmental and psychologic characteristics that are seen with great frequency in the asthmatic.

The patient is usually described as a passive-aggressive-dependent type of person whose love and dependency needs are so great as almost to defy fulfillment. A sense of insecurity and tremendous amounts of unconscious hostility and latent aggressive trends result from these relatively unfulfilled dependent needs. The principal parent figure, usually the mother, is found to be an aggressive domineering person whose erratic, smothering type of protective love cloaks her own feelings of hostility and her frustrated achievement drives. The result is usually a timid, querulous person with few inner strengths, and severely impaired ability to function as an independent organism. Weiss has compared the asthmatic wheeze to the cry of the infant for his mother.

The following case is presented as an illustration of a situation in which both allergic and emotional factors were operative in the causa-

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tion of the patient's asthma. It is of additional interest insofar as it presents a longitudinal picture of diagnostic and treatment procedures at the Child Guidance Clinic of the Neuropsychiatric Service at this hospital.

### CASE REPORT

This 10-year-old boy was first brought to the clinic because of severe bronchial asthma in September 1948. The mother complained also of the boy's irritable, seclusive and occasionally bizarre behavior. He spent most of his time sitting in his rocking chair listening to the radio; he spoke infrequently, used sign language a good deal, and showed much negativistic behavior toward his parents. His attendance at school was erratic because of his numerous asthmatic attacks in the past 8 years. At the time of his coming to the clinic, the mother estimated that the patient was spending from one-half to two-thirds of his time in the children's ward of the hospital. Although his asthmatic attacks while in the hospital were neither as severe nor as frequent as when he was at home, vigorous medication was still necessary when he had his attacks. In the first year and a half of his life the patient had eczema and urticaria although there was no history of allergic phenomena in the family. Thorough examination had revealed no significant pathologic findings, and the child had been referred to the Child Guidance Clinic for further study.

He was a wanted child and was born about 20 months after his parents' marriage. When he was 4 years old his father left for active duty in the Air Force and did not return home until the patient was 6. During that time the patient and his mother were inseparable and the return of the father into the home precipitated repeated emotional storms in one of which the patient cried to his mother, "Let's lock the door and not let him in." Relationship between the boy and his father improved somewhat in the past 3 years but there were no open demonstrations of affection. The birth of a baby sister when the patient was 7 produced no obvious disturbance. The mother always felt that the boy was sickly, abnormal, and "slow" and had taken him to a great number of physicians. She was incensed by his continuing passively hostile attitude and his inability to make a better showing in school. His asthmatic attacks frequently came on in the evening shortly before the mother's own bedtime. When this happened the mother was obliged to spend the night in her son's room. An interview with the father was considered desirable but he could not leave his job during working hours.

### *Examination*

The patient was a small, asthenic, rather elfin looking boy, appearing somewhat younger than his stated age. He insisted on remaining with his mother while she was interviewed by the psychiatrist. He said he would not listen, but it was noted that the comic book that he was supposedly reading was held upside down. Questions were answered with single words or by sign language, and for the remainder of the time he sat dreamily in his chair, gazing at the opposite wall of the office. His behavior continually angered his mother who alternately threatened and spurred him on.

Psychologic examinations revealed that the boy was functionally of borderline mentality with a mental age not exceeding the average 7-year-old. His I Q (Stanford Binet) was 70. There were strong suspicions, however, that this was not a true indication of his basic potentialities as emotional blocking might have

played a role in this performance. Part of this opinion was based on the fact that his reading ability was equal to that of the average child starting fourth grade. His comprehension and recall were also adequate and equal to that of the average child 9 or 10 years of age. He appeared to have a well-developed fantasy life and showed many symptoms of personal maladjustment.

### *Treatment*

Both the patient and his mother were given weekly therapeutic interviews; the boy was seen by the psychiatrist in play therapy and the mother by the psychiatric social worker. Because of several severe bouts of asthma, therapy was not started until 3 months after the initial contact with the clinic.

When the patient entered the playroom for the first session he was indecisive and announced that the toys were of no interest to him. After some encouragement he finally decided to play checkers. The first time the patient made a "king" and it was pointed out that he was now a "king on the board," he said, "No, I'm not; I'm nobody." He lost all the games and said, "I don't mind losing. It's just the sportsmanship." It was suggested that it was all right to feel bad about losing or about being unimportant, but the patient could not accept this. His feelings about his smallness were again brought out as he had the therapist build large block structures, followed by the construction of much smaller buildings of his own. The differences in size were further elaborated verbally. In the second session the patient experimented with small shows of hostility, throwing crumpled paper on the floor, messing delicately with the finger paints, and then more enthusiastically when he discovered that rejection was not threatened. As he gained confidence he splattered paint and tore off sheets of paper with distinct enthusiasm and a voluble flow of speech. He came to the third session with his own set of finger paint and produced a picture of a heart inside a larger heart, writing the word "love" under it. He asked for the therapist's first name and then wrote "Arne's" above the heart. This meant "Arne's love" which the therapist obviously owed to his wife. In the patient's home, however, there was no love since his mother and father always fought. He disregarded the suggestion that love seemed rather important to him and produced another version of "Arne's love." He then admitted that he was not loved, said that love was what he wanted, and volunteered to produce something for every room in the Child Guidance Clinic. He said there were five members in his family including a talking parrot, but specifically excluded the younger sister, stating that he was the only child. During the session he appeared to be testing out the therapist, making a bid for his love and attention, and indicating how lonely and unloved he was.

Next time the patient brought the therapist an orange. He then spent most of the time drawing animals for the therapist and adding abdominal appendages which he first called "the tail," then later "the tip" and finally "the tits." There was some discussion of masculine-feminine differences, but the patient blocked rather readily. In the next period he further amplified his feelings about his family by drawing a heart with an arrow through it, printing "happy" beneath it. He said this represented the whole world and also his family, both of which he wished to be happy. He then drove a toy rubber knife through the heart until he had torn it up completely, stating that this was what happened when there was a fight in the family. There followed a discussion of how the children of a family felt when the parents fought, and the patient was finally able to admit that aggressive attitudes on the part of the parents severely threatened the security of the children. The patient then carried the initials "USA" on

the back of one of the playroom chairs, and when it was suggested that it would be wise to stop since this would eventually come to the attention of the general, he launched into an attack against "the old general who is always putting his nose into things," which increased in feeling until the patient was running around the room, shaking his fist and swearing. It was suggested that generals might be like fathers and the patient agreed, adding that they were even more like mothers, "always minding somebody else's business." After verbalizing and acting out tremendous amounts of hostility the patient printed a sign reading, "mind your own business" hung it outside the door, then in a triumphant frame of mind made his mother come back to see it.

In the following session the patient became physically aggressive toward the therapist and when it was pointed out that this could not go on, the patient hit himself over the head with his toy revolver. It was suggested to him that he probably often hurt himself when he felt like hurting others. He said this was true, and then described how he wished he were a magician so that when his parents came to whip him, he could turn the tables and give them a merciless drubbing. Unfortunately he was small and unimportant and his wishes never mattered. The therapist agreed that he could not do this, but suggested that it was sometimes as good to talk out one's feelings and the patient agreed.

In the next several interviews, the patient continued to act out aggressive feelings toward the therapist, gradually developing a more realistic conception of the limits to which he could carry this. He could now express his feelings of hostility and frustration over losing checker games and was able to state further that he realized he lost because of his own inexperience compared to the therapist's and that eventually he would get better and might win. He was complimented both on the improvement in his playing technique and on his more realistic and mature attitudes. By the end of the thirteenth session it was felt that the patient deserved a temporary cessation of therapy since improvement had been so great. At that time he had not had an attack of asthma for about 7 weeks.

The mother reported distinct changes in the boy's personality, with enthusiastic socialization, a normal amount of small-boy aggressiveness and an increasingly happy relationship between father and son. She was also pleased that his work in school had shown improvement. Her own attitude, too, had shown definite changes. She had become relaxed and relatively free of anxiety concerning the patient. She felt that he was capable of proceeding at his own rate and let him do so. The result was obvious improvement in the mother-son relationship. A general change for the better in the family atmosphere had occurred along with symptomatic improvement in the boy.

In an attempt to determine whether there was any noticeable change in the level of mental function and potential over that indicated by the first set of psychometric examinations, a second group of tests was given to the boy 1 month following cessation of therapy. The Stanford-Binet findings were astonishingly consistent in their demonstration of a functional age level 3 years below the stated age. Arithmetical conceptions, practical judgment, visual motor coordination, and language comprehension all continued to show retarded developmental status. On the other hand, the Rorschach data delineated basic intellectual qualities that were well above average and near the adult level. There was good productivity, ability to maintain attention, abstract conceptualization and adequate intellectual control. The performance intelligence examination (Good-enough) reflected growth in use of abilities during the therapy period. Since school work was also up to average or better in the later stages and following therapy, and his reading also adequate for his grade, these, along with the

Goodenough scale and the Rorschach, seemed to refute the Binet findings of continued borderline intelligence. The psychologist made the suggestion that the possibility of organic dysfunction, especially convulsive disorder, should be explored. An electroencephalogram was normal and there was no evidence of any organic lesion. The final impression was that the boy was still emotionally immature for his age and approximately at the intellectual level as indicated by the Binet rather than the Rorschach test.

In the 9 months since the termination of therapy, the patient has been seen periodically. He has been completely asthma-free except for one brief episode early in the pollen season.

### DISCUSSION

This patient presented a problem of severe bronchial asthma associated with a moderately severe personality disorder. His asthma appeared directly related to a combination of definite allergic diathesis, plus a disturbed emotional situation in the family environment, manifested primarily by poor parent-child relationships. Over a relatively short period of therapy in which the boy was seen once each week for 13 weeks by the psychiatrist, and the mother for half-hour periods at similar intervals by the psychiatric social worker, definite improvement occurred in family interpersonal relationships as well as in the boy's personality. The complete clinical remission of the patient's asthma, with the exception of one brief episode early in the pollen season, would seem to indicate that psychogenic factors were operating as an important trigger mechanism in setting off this patient's attacks of bronchial asthma.





oozing with the pyribenzamine ointment produced more rapid decrease in swelling.

Fifty milligrams of pyribenzamine was given orally five times a day to four Grade II patients, but was promptly discontinued because it did not relieve itching. Two patients had a complicating purulent infection that responded dramatically to use of aureomycin orally. In general, removal of the tops of the larger blebs and the application of warm compresses appeared to lessen pain and accelerate healing. Unopened small blebs and vesicles dried readily.

#### COMMENT

Appraisal of the effects of various forms of treatment for *Rhus* dermatitis is difficult because of uncontrollable variables. Using different forms of local therapy in areas of a similar degree of involvement, in the same patient, allows the observer to evaluate the relative merits of the treatments employed. Unless investigations are conducted in this manner, conclusions are likely to be invalid. Contradictory statements concerning the efficacy of intramuscular injections of poison ivy extract in the treatment of *Rhus* dermatitis result from the fact that lesions on the same patient cannot serve as a basis of comparison. Unfortunately, most workers have used few if any controls. It is recommended that a large group of hospitalized patients be used for an appraisal of the effect of injections. Equal numbers of cases of about equal severity should be chosen for the treated and the control groups. The patients receiving injections should receive no local treatment. The opening of the larger blebs and bullae and the application of warm Burow's solution compresses is an effective method of treating *Rhus* dermatitis. Although it is uncertain whether the additional use of medicaments applied to the surface essentially shortens the course of the illness, this investigation gave some indication that the use of pyribenzamine ointment, locally, may accelerate healing.

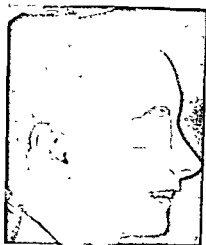
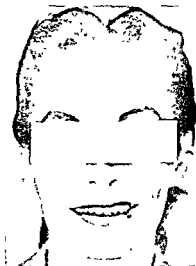
#### SUMMARY

*Rhus* dermatitis constitutes an important cause of loss of time from duty. In 70 patients, results of the simultaneous use of pyribenzamine ointment and calamine with phenol and menthol were compared. These treatments were about equally effective in the control of pruritus. No constant effect on the speed of healing was observed since one-half of the patients improved equally rapidly with both medications. Of the remaining half, 71 percent improved more rapidly with pyribenzamine. Further trials with pyribenzamine ointment locally are recommended, especially on lesions around joints.



*Figure 1.**Figure 2.*

Roach type clasps were chosen to retain the case because of the short crowns, but since the contours of the teeth were unfavorable for good retention even by this type of clasp, mild grooves were cut just below the height of the contour on the upper and lower first and second bicusps and first molars with diamond stones, and smoothed with cuttlefish disks, then pumice, and finally burnished with rubber wheels. These grooves were then treated with 4 applications of sodium fluoride. The grooves were not cut through the enamel, but merely provided

*Figure 3.**Figure 4.*

definite areas in which to place the Roach T. The bite opening was determined by experimentation to be about 2 mm. This was the least amount that would provide sufficient space for a restoration, and apparently the maximum amount that would still allow for a comfortable freeway space. A trial setup with facings showed that even with the alveolectomy and the new lingual position of the labial portion, it would require 8 teeth to provide a cosmetic result. A lower partial denture with cast occlusal shims would be used to provide the bite opening. The cases were waxed accordingly and cast in vitallium.

The cosmetic result on placement of the dentures is apparent in figures 3 and 4. Closing of the bite caused constant temporomandibular pain varying in intensity in direct ratio to the amount of work performed by the jaw. Within 1 week after insertion of the cases, lessening of this pain was reported, and at the end of 1 month no discomfort was present. At the end of 12 months, there was no recurrence of joint pain. Ability to bite and masticate food with ease without associated palatine pain was reported within 1 week. Psychologically, an appreciable benefit was noticed in about 3 weeks, which was the period necessary for the patient to realize that her mouth need not be covered in conversation, smiling, or laughing. When the moment was reached, the automatic covering gesture with the handkerchief or hand began to cease, and by the end of 8 weeks, had been completely abandoned.



# Effectiveness of Newer Drugs in Seasickness

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MOTION sickness has been observed for centuries, but no intensive study had been carried out until World War II when, because of the large-scale amphibious operations and the great number of men needed for sea duty, it was realized that efforts must be made to keep motion sickness at a minimum and thus maintain men at their maximum efficiency.

The data in this article were obtained during a tour of duty on a naval transport, the U. S. S. *General George M. Randall*, which carries dependents, civil service personnel, and troops to installations in the Pacific area. Thus results were compiled from the action of antihistaminic drugs in men, women, and children, giving a more complete picture than would be possible if only young men were used in the study.

Cecil (7) defines motion sickness as "a condition due to frequently repeated oscillating movements of the body in a ship or airplane, characterized by dizziness, nausea, vomiting, pallor, and sweating." The syndrome is essentially due to disturbed vestibular function. Visual, psychogenic, and kinesthetic factors play subsidiary roles that vary with the individual. It was found that aboard ship food odors and poor ventilation were predisposing factors.

Symptoms of motion sickness appear suddenly and any or all of the following are present: nausea, excessive salivation, mental depression, vomiting, headache, pallor, and cold sweats. In about 48 percent of persons making their first ocean voyage the self-descriptive condition "epigastric awareness," is present although they do not become ill.

The psychogenic factor has been noted to be an etiologic agent in motion sickness. Desnoes (5) pointed out that in some susceptible persons, signs of seasickness develop as they board the ship and prior

<sup>1</sup> U. S. S. *General George M. Randall*

to sailing. The author has seen three women, who had been seasick on a previous voyage, who became nauseated and vomited while walking up the gangplank to the ship.

According to reports in the literature, infants under 3 years of age and elderly persons are seldom afflicted with motion sickness. It is difficult to determine if the frequent gastrointestinal upsets seen in small infants are due to motion sickness or to the change in milk and water.

Motion sickness in the past has been treated by sedation and/or the use of drugs that suppress the parasympathetic nervous system. Some of the drugs used were sodium amytal, scopolamine hydrobromide, barbital, sodium nitrate, bromides, belladonna, and various coal tar derivatives. Hamilton (6), in 1932, reported 400 cases of seasickness in persons between the ages of 16 and 60 years and concluded the most satisfactory drugs in treatment were sodium amytal, scopolamine hydrobromide, and barbital. Bryan reported a series of cases treated by hypnosis with unsatisfactory results.

During World War II, intensive and thorough investigation in the study of motion sickness was carried out. As a result of this work, Army Motion Sickness Preventive, or M. S. P., was conceived. This consisted of the following drugs in a capsule: sodium amytal, 130 mg.; atropine sulfate, 0.3 mg.; and hyoscine hydrobromide, 0.4 mg. This medication was distributed to service personnel (during the war) and was taken one-half hour before embarking and then not oftener than every 4 hours for as short a period as possible. Several investigators reported on the efficacy of M. S. P. as a preventive and there was a wide range of results. The best results reported showed that only 4 percent of personnel became seasick while taking M. S. P. whereas 10.1 percent of those who received placebos and 28.4 percent of the untreated personnel became ill.

Assuming that M. S. P. was the best known method of therapy at that time (1944), it was the only standard that could be used for comparison with newer drugs. I chose benadryl for intensive trial in the treatment of motion sickness because it was suggested to me by another physician who stated that he had no real basis for believing it to be of value but would like to see it tried. About 6 weeks after this investigation was started, Gay and Carliner (7) released their work on dramamine. As dramamine is also an antihistaminic and has a benadryl base I was encouraged to continue with the study of benadryl and also secured enough dramamine to include it in the investigation.

The results of the use of these drugs in seasickness only are discussed in this article; I had no opportunity to study their action in airsickness.

## PROCEDURE

The medications used in this study were Army Motion Sickness Preventive, benadryl, dramamine, and placebos.

Because different weather conditions were encountered on each trip, all drugs were used in a selected number of cases on each voyage and the results tabulated on a comparable basis. This article is based on the over-all average results during each trip; thus the results obtained from the use of any one drug were not bettered by good weather conditions.

The investigation was divided into two phases therapeutic and prophylactic.

In the determination of the therapeutic value of the drugs, no presailing medication was given to any passenger. Therapy was begun only when the person reported to sick bay with symptoms of motion sickness. The first four persons seen were given placebo, M S P., benadryl, and dramamine respectively in that order, and the routine repeated with each succeeding four persons. Each person was instructed to take one tablet immediately and one every 4 hours thereafter until symptoms were relieved or until five tablets were taken. Those persons given benadryl were told to take two capsules immediately and then one capsule every 4 hours. All were told to return when both objective and subjective symptoms subsided, and the patient's word was used as the index of the effectiveness of the medications. Two days was set as the time limit in which drugs were credited as being of value because in that time 40 percent of those persons under study were symptom-free and required no medication. One thousand two hundred cases of motion sickness were observed in this phase of the investigation.

The prophylaxis of motion sickness was attempted by issuing medication for the passenger, with typewritten instructions to take one capsule 30 minutes before sailing time and then one every 4 hours until the five units of medication given each passenger were consumed. These instructions were repeated verbally to an assembly of all passengers with the added request that they report to sick bay if any illness developed. One thousand six hundred persons were observed in this phase of the study.

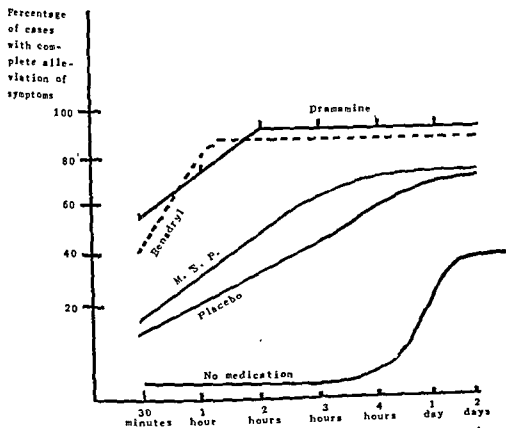
## RESULTS

*Therapeutic effectiveness.*—As shown in figure 1, those persons to whom no medication was given remained ill for the first 24 hours; by the end of 48 hours about 40 percent had recovered.

When a placebo (lactose) was given, 14 percent of the persons reported they had recovered at the end of 30 minutes and 46 percent

reported themselves cured in 4 hours when the second placebo was given.

Army Motion Sickness Preventive produced alleviation of symptoms in 17 percent at the end of 30 minutes and maintained a slow but steady rise until, at the end of the second day, 71 percent of the persons receiving the drug reported themselves to be symptom-free.

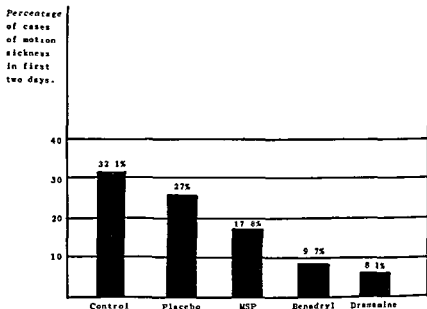


Time in which complete alleviation of symptoms occurred after medication started in 1200 cases of motion sickness.  
Figure 1.—Effectiveness of therapeutic medication.

Forty percent of those persons receiving 100 mg. benadryl stated that they were "cured" in 30 minutes whereas, at the end of 60 minutes, 82 percent were symptom-free. This increased to 88 percent at the end of 2 hours and no higher percentage of relief was obtained throughout the 2-day period of administration of benadryl.

Dramamine gave relief in 58 percent of motion sickness cases in the first 30 minutes, 76 percent in 60 minutes, and 91 percent in 2 hours. The figure of 91 percent was not exceeded during the 2 days of medication.

*Prophylactic effectiveness.*—Figure 2 shows that when no medication was given prior to or immediately after sailing, 32.1 percent of the passengers had symptoms of motion sickness. When placebo-



Medication given  $\frac{1}{4}$  hour before sailing and then with each meal for 2 days. Each medication was given to 400 individuals.

*Figure 2—Effectiveness of prophylactic therapy.*

were given, 27 percent had objective signs of seasickness. With M. S. P. only 17.8 percent became seasick. When benadryl was given as a prophylactic 9.7 percent had motion sickness. Dramamine protected all but 8.1 percent from motion sickness.

#### COMMENT

The difference in prophylactic value of 5.1 percent between placebo and no medication at all is not striking. However, the fact that 14 percent of those given a placebo after motion sickness developed recovered in 30 minutes and 60 were symptom-free at the end of 24 hours, whereas only 11 percent of those not receiving medication were symptom-free in 24 hours emphasizes the psychological aspect of motion sickness. This contention is supported by the three women who became nauseated while ascending the gangplank. These figures do not, however, support those who believe motion sickness to be merely a "state of mind"; the author is convinced that the psychological aspect plays a relatively minor role in motion sickness. Our results with M. S. P. were disappointing when compared with those reported by other observers working with this medication. In its favor is the absence of toxic symptoms observed by other investigators when the same dosage was used. The 29 percent of persons who had

not improved after 2 days of M. S. P. were given either benadryl or dramamine with complete relief of symptoms in a few hours in the majority of cases.

Benadryl proved more effective than dramamine in the period from 45 to 90 minutes after administration but was surpassed at that point and remained 3 percent less effective throughout the remaining time. Since benadryl has a hypnotic effect on many persons, it was at first thought much of its value was due to the extreme drowsiness produced. However, the administration of 2.5 mg. of benzedrine sulfate with each 50 mg. of benadryl eliminated much of the drowsiness and did not seem to change the therapeutic efficacy of the drug.

In our study of the drug, although dramamine did not prove as effective as reported by Gay and Carliner, it was dramatic in its alleviation of motion sickness. The high cost of dramamine and the relatively little difference in therapeutic value as compared to benadryl does not merit its exclusive use.

Rectal administration of dramamine was deemed necessary in only one case, a woman 5½ months pregnant who could not retain anything taken orally. A retention enema of plain water with 100 mg. dramamine gave relief in 70 minutes and the patient was continued on oral therapy. In most cases, immediate repetition of the medication after vomiting was sufficient to control the motion sickness.

In addition to the treatment of the usual cases of motion sickness, seven women, all of whom were less than 5 months pregnant reported to sick bay with a history of vomiting several times daily before coming aboard ship and the condition had persisted. Two of the women had been receiving injections of pyridoxine without complete relief, the others had not consulted a physician. Both dramamine and benadryl proved effective in five of the seven cases. Either dramamine or benadryl was given until the vomiting ceased, the drug withdrawn and placebos given until the vomiting recurred, and then the other drug given in turn. One of the women responded only to dramamine and one did not respond to benadryl, dramamine, or pyridoxine; she was transferred to a naval medical facility at the first port. It was noted that none of the women benefited by the placebo which was substituted for the drugs without their knowledge.

#### TOXICITY

No toxic reactions were seen from M. S. P. although the literature states that hallucinations, mental cloudiness, change of heart rate, dry mouth, and cessation of sweating are all commonly found with overdosage.

No severe toxic symptoms resulted from benadryl; however, drowsiness was noted in 58.2 percent of a selected number of persons receiving



# Progeria in the Adult (Werner's Syndrome)

## Report of a Case

B. ROONEY FORCE, *Lieutenant (MC) U. S. N.*<sup>1</sup>

CLIFFORD P. POWELL, *Captain (MC) U. S. N.*<sup>2</sup>

PATIENTS who look 20 to 30 years older than their stated age bring several conditions to mind, such as arteriosclerosis, Simmonds' disease, carcinoma, emphysema, and malnutrition. A group of syndromes associated with premature aging are those of Werner (progeria of the adult), Rothmund, and Hutchinson-Gilford.

Thannhauser (1) reviewed these entities completely and stated that more cases will be found if the condition is kept in mind. Other problems of interest arise: What comprises "growing old," the nature of arteriosclerosis, and the effects of the dynamic equilibrium of the endocrine systems?

Werner's syndrome was first described in 1904 by Otto Werner and named in 1934 by Oppenheimer and Kugel (2) who first reported the condition in the American literature. It has some or all of the following characteristics: (a) shortness of stature; (b) canities (premature graying of hair); (c) premature baldness; (d) scleropoikiloderma; (e) trophic ulcers of the legs; (f) juvenile cataracts; (g) hypogonadism; (h) tendency to diabetes; (i) calcification of blood vessels; (j) osteoporosis; (k) metastatic calcifications; and (l) tendency to occur in siblings. These were evident in members of family "K" as related by Werner (2). A typical case has early graying, premature baldness, tight atrophic skin over ankles, hyperkeratosis of the feet, leg ulcers, cataracts before the age of 30, a high-pitched voice, short stature, and some endocrine disorder as manifested by an enlarged thyroid. In general, signs of arteriosclerosis and premature aging are present. The condition is considered to be a recessive heredofamilial disorder with skin manifestations of "heredofamilial atrophic dermatosis with skin ulcers." *Formes frustes* may occur.

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## CASE REPORT



Figure 1.—Complete alopecia.

Between 1941 and 1947, he gradually became totally bald and in 1945 all the pubic and axillary hair disappeared (fig 1). During this time many characteristics of aging were noted (figs. 2 and 3). He complained of generalized weakness and noticed a considerable loss of energy and sense of well-being during the past year.

*Family history.*—His mother and father died at ages 67 and 78, respectively. He has four brothers living and well, and a daughter by a previous marriage who is also well. No member of the family in any generation has had a similar condition so far as is known.

*Physical examination.*—The patient is a thin, short, white man appearing about 70 years of age. His skin shows generalized atrophy and wrinkling, most noticeable over the legs and hands with some lichenification around the ankles. Small fine white scales are present on most of the skin. He has complete alopecia. Numerous wrinkles are present about the eyes, associated with folds of loose atrophic skin hanging from the submental area. The lower extremities are a violaceous color; numerous healed and partially healed small ulcers are present on the

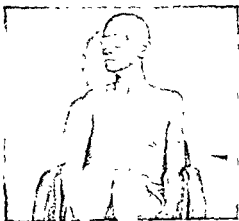


Figure 2.

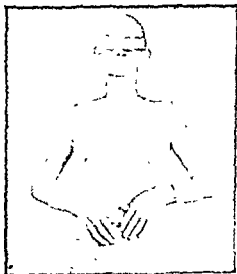


Figure 3.

diromes it is the consensus that they result from multiple germinal defects because they present recessive characteristics, are of hereditary-familial occurrence, and because endocrine manifestation is only one of the multiple features.

### SUMMARY

A case of possible atypical progeria in a man 45 years of age appearing to be 70 is reported for the purpose of stimulating attention to the syndrome of premature aging. It is believed other cases will be reported if the condition is kept in mind.

### REFERENCES

1. THANNHAUSER, S. J. : Werner's syndrome (progeria of adult) and Rothmund's syndrome—2 types of closely related hereditary-familial atrophic dermatoses with juvenile cataracts and endocrine features, critical study with 5 new cases. *Ann. Int. Med.* 23: 559-626, Oct. 1945.
2. OPPENHEIMER, B. S. and KUGEL, V. H. : Werner's syndrome, a hereditary-familial disorder with scleroderma, bilateral juvenile cataract, precocious graying of the hair and endocrine stigmatization. *Tr. A. Am. Physicians* 49: 358-370, 1934.
3. WERNER, C. W. O. : *Über Katarakt in Verbindung mit Sclerodermie*. Onaug. Dissert., Kiel, 1904.
4. ROTHMUND, A. : *Über Katarakt in Verbindung mit einer eigent. ungleichen Hautdegeneration*. *Arch. Ophth.* 14: 159, 1908.
5. HUTCHINSON, J. : Congenital absence of hair and mammary glands, etc. *Medicochir. Trans.* 99: 473, 1886.
6. GILFORD, H. : On a condition of mixed premature and immature development. *Medicochir. Trans.* 130: 17, 1897.
7. GILFORD, H. : Progeria, a form of senilism. *Practitioner* 123: 188, 1904.
8. GILFORD, H. : Progeria and ateliosis. *Lancet* 1: 412, 1913.
9. OPPENHEIMER, B. S., and KUGEL, V. H. : Werner's syndrome, report of first necropsy and of finding in new case. *Am. J. M. Sc.* 202: 629-642, Nov. 1941.
10. THANNHAUSER, S. J. : Hereditary ectodermal dysplasia of anhydrotic and hydrotic types. *Practitioner* 13: 473, 1938.



# Urinary Excretion of 17 Ketosteroids in Tetraplegic and Paraplegic Patients

## A Preliminary Metabolic Report

ALBERT W. COOK, *Lieutenant, junior grade (MC) U. S. N.*<sup>1</sup>

HAROLD A. LYONS, *Commander (MC) U. S. N.*<sup>2</sup>

EVER since Selye (1) introduced his theory of the adaptation syndrome, he and others have attempted to explain various conditions by this hypothesis. The chronic paraplegic patient with persistent bedsores, genito-urinary tract infections and renal calculi, gastrointestinal ulcers, and other lesions represents a situation when an organism is subjected to repeated stimuli over a prolonged period of time. The occurrence of systemic deterioration in these patients concomitantly with the appearance of such stimuli provoked the suggestion (2) that a humoral mechanism might be involved. Our interest in this problem was also stimulated by the fact that post-mortem examination of several of these patients showed considerable deposition of a substance resembling amyloid in the adrenal glands (3), and in each instance the cortex of the glands was most severely affected.

We became interested in the urinary excretion of the 17 ketosteroids in this type of patient as a direct result of these observations. In addition, it was believed that this would be an opportunity to evaluate the physiologic effect of interruption of the spinal cord on the excretion of these same products. Such observations seemed particularly pertinent since Bustamante (4) postulated a direct neural connection between the hypothalamus and the gonads, even though Reitman (5) recently discounted any such mechanism when he discussed the changes in the 17 ketosteroid excretion following frontal lobotomy.

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## MATERIAL AND METHODS

The determinations of the 24-hour urinary excretion of the 17 ketosteroids (total neutral fraction) were performed by the Sloan-Kettering Institute, Section on Clinical Endocrinology, Memorial Hospital, New York, according to the method outlined by Engstrom (6). The results of this study in 21 patients, all men, are listed in table I. The age of each patient is also included because of the difference in excretion of these substances in various age groups (7).

TABLE I—*Urinary excretion of 17 ketosteroids in tetraplegic and paraplegic patients*

Case No	Age	Spinal cord level	Ketosteroid excretion (mg. 24 hr.)	Case No	Age	Spinal cord level	Ketosteroid excretion (mg. 24 hr.)
			Date Amount				Date Amount
1	24	C7	10-29 3.2	10	36	T3	12-17 13.8
			11-29 8.8	11	29	T10	11-5 10.5
			12- - 18.6				12-17 8.6
2	22	C6	10-29 12.6	12	20	T10	10-29 8.8
			11-12 15.0				12-17 20.8
3	27	T9	11-11 6.4	13	60	T11	11-24 5.7
			11-30 14.0	14	28	T4	10-29 4.0
4	21	C6	10-29 1.50				11-29 14.0
			11-29 23.6				12-17 8.4
			12-17 19.0	15	23	T9	11-5 21.4
5	34	T12	11-12 17.8				11-30 16.0
			11-30 17.4	16	22	T12	10-29 1.1
6	24	T12	10-29 9.6				11-29 7.6
			11-30 13.0	17	23	L1	11-5 10.10
7	21	T7	11-5 21.4	18			11-24 28.0
			11-29 18.0				11-29 8.6
8	25	D10	10-29 8.0	19	21	T12	11-11 11.20
9	23	T12	10-29 7.7	20	24	C6	11-5 10.9
			12-17 8.6	21	28	T5	11-11 9.9

NOTE.—The normal range of excretion in the urine of the 17 ketosteroids (TNF) for the age group 20 to 40 years is 6.1-22.6 (7)

## RESULTS

The total number of determinations have been recorded, but it should be noted that some results (29 October 1945) tend to be very low. Since these were the first collections and determinations that were done and, particularly, since they were at great variance with other results in the same patient, we believe that no significance can be attached to them. They are reported for completeness only. The remaining values, however, are not indicative of an abnormal excretion of these substances, even though several reports seem to be lower than normal. This assumption is entirely warranted when it is remembered that there is a daily variation in these figures in the individual and that unless a result is repeatedly constant no real value can be attached to it (8).

Since both the testicles and the adrenal cortex are concerned with the appearance of these excretory products in the urine, case No. 13 was of special interest. In this instance the patient had had a bilateral orchidectomy for carcinoma of the prostate with metastases

to the spine. This result must also be considered normal in the light of Kimeldorf's work on rabbits (9). He found that there was a 41 per cent decrease in the excretion of the 17 ketosteroids (TNF) in the urine following castration.

#### DISCUSSION

It is apparent that prolonged interruption of spinal cord function in man has no significant effect on the excretion of 17 ketosteroids (TNF) in the urine. It is surprising, however, that significant decreases were not noted in some instances; namely, in those patients who have had repeated infections and painful episodes as well as those with extreme liver disease (7).

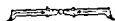
Although further studies on the adrenal cortical function of these patients are in progress and still incomplete, these studies seem to indicate that hypofunction of the adrenal cortex is not associated with the so-called "paraplegic" state.

#### SUMMARY

The chronic paraplegic excretes a normal amount of 17 ketosteroids in his urine over a 24-hour period. The results reported here tend to exclude adrenal cortical insufficiency as the cause of the failure of some of these patients to react adequately to distressing stimuli.

#### REFERENCES

1. SELYE, H.: *Textbook of Endocrinology* (Acta Endocrinologica). University of Montreal, Montreal, Canada, 1947 p. 847.
2. HOEN, T. L.: Personal communication.
3. REDFIELD, E.: To be published.
4. BUSTAMANTE, M.: Experimentelle Untersuchungen über die Leistungen des Hypothalamus, besonders bezüglich der Geschlechtsreifung. *Arch. f. Psychiat. Nervenkr.* 115: 419-468, 1942.
5. REITMAN, F.: Steroid metabolism and frontal lobes. *Brit. M. J.* 2: 1061, Dec. 1948.
6. LINGSTROM, W. W.: Nature and significance of neutral steroids in human urine in normal and in abnormal states, with a preliminary consideration of the adrenal and gonadal steroids and factors which influence their secretion and biological action. *Yale J. Biol. & Med.* 21: 21-85, Oct. 1948.
7. FRASER, R. W.; FORBES, A. P.; AUBRIGHT, P.; SILKAWITZ, H. and REYNOLDS, D. C.: Colorimetric assay of 17 ketosteroids in urine, survey of use of this test in endocrine investigation diagnosis and therapy. *J. Clin. Endocrinol.* 1: 234-256, March 1941.
8. WEISER, S. C.: Daily variation in 17 ketosteroid excretion of men and women. *J. Clin. Endocrinol.* 1: 951-954, Dec. 1941.
9. KIMELDORF, D. J.: Excretion of 17 ketosteroids by male rabbits during altered gonadal function. *Endocrinology* 43: 81-88, Aug. 1948.



# Circumcision of the Newborn

## An Exact Technique for the Use of the Gomco Clamp

WILLIAM W. MANSON *Lieutenant Commander (MC) U. S. N.<sup>1</sup>*

FROM 15 March 1948 to 15 March 1949, 387 circumcisions on newborn infants were performed by the author and his associates with the Gomco clamp. During the first half of this period, 2 circumcisions had to be repeated because of postoperative phimosis caused by the removal of too little tissue at the initial operation. Since then an exact technique for the use of the Gomco clamp has been followed and there have been no postoperative complications. Although Pugh (10) condemns any type of preputial clamp because of the danger of secondary bleeding, there were no cases of postoperative hemorrhage in the entire series performed with the Gomco clamp.

Wolbarst (12), after an extensive study, concluded that at least 225 deaths from penile cancer and approximately twice as many non-fatal cases could be prevented annually in the United States by circumcision of all male children in infancy. Phimosis was universally recognized as the most important factor in penile cancer. We advise circumcision of all infants whose foreskin cannot be dilated sufficiently to permit easy retraction over the glans penis. The operation is performed on the fourth day of life but deferred if the infant weighs less than 5 pounds 8 ounces, or is clinically jaundiced.

A review of the literature reveals a variety of circumcision clamps in use. In 1907 Borey (4) described a clamp with much the same principle as the Gomco clamp but, from his description, less sturdy and more complicated. Since then many authors (1) (2) (3) (7) (8) (9) have described circumcision clamps, guides, and forceps of varied simplicity and ingenuity.

In 1935, Yellen (13) described a clamp developed by Aaron Goldstein, of Buffalo, N. Y. and used successfully in over 500 newborn circumcisions. In 1939, Brodie (5) reported 300 cases of infant circumcision with the Yellen clamp. According to a personal communication from the manufacturers, the present Gomco clamp is the same

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clamp with a few modifications that was described by Yellen. This is the clamp that was used in our 387 circumcisions.

### TECHNIQUE

A mosquito forceps is attached to each side of the tip of the foreskin. The point of a third mosquito forceps is then introduced between the foreskin and the glans as shown in figure 1. By opening this forceps and rotating it on its longitudinal axis the adherent mucosa is partially separated from the glans penis.



Figure 1.—Use of mosquito forceps.

A dorsal slit is then made with its apex 0.75 cm. distal to the corona, the outline of which may be seen through the fore-skin when it is stretched slightly by traction on the mosquito forceps attached to the lateral margins of the foreskin (fig. 2). Dorsal veins in the foreskin may be readily seen and avoided when making the dorsal slit, thus the blood loss is negligible.

The mosquito forceps are then removed from the lateral margins of the prepuce and the prepuce is retracted back from the glans penis to completely free all the adhesions between the mucosa and the glans. All the smegma is carefully removed by wiping the coronal sulcus with a gauze sponge.

The cone of the Gomco clamp is then placed over the glans penis and the foreskin is pulled out over the cone. It is important to make certain that mucosa as well as the foreskin is over the cone. Two sizes of cones, a small (diameter 1.0 cm.), and a large (diameter 1.2 cm.), have been found to suffice for all newborn circumcisions.

The hole in the plate of the Gomco clamp is then easily slipped over the foreskin-covered cone and



Figure 2.—Dorsal slit.



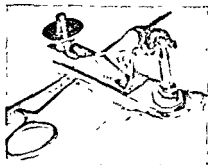


Figure 3.—Gomco clamp in place

the foreskin pulled up evenly around the cone with plain thumb forceps. Reaching through the hole in the plate with mosquito forceps, attaching sutures to the foreskin to pull it through the hole in the plate, or other complicated procedures are not necessary. When the plate and the cone are assembled properly and screwed firmly into place, the apex of the dorsal slit should be 0.25 cm. distal

to the margin of the hole in the plate as shown in figure 3.

After a 5-minute wait for pressure hemostasis, the foreskin is cut off flush with the margin of the hole in the plate. The clamp is then unscrewed, disassembled, and removed. As recommended by Walker (11) enough foreskin is left to cover the corona during relaxation of the penis (fig. 4). Figure 5 shows the foreskin retracted into the position in which it is left during the healing which prevents reforming of adhesions between the mucosa and glans.

The dressing used is similar to that described by Clarke (6) for adult circumcisions. The penis is wrapped in vaseline gauze and covered by a 4-inch square gauze pad, one layer of which contains a hole through which the penis is placed using the intact layer of gauze as a cover. The open ends of this dressing are tucked up under the infant's bellyband to complete the dressing.



Figure 4.



Figure 5.

## CONCLUSIONS

1. Circumcision of the newborn is indicated in all cases in which the foreskin cannot be readily dilated and retracted over the glans penis.

2. Circumcision should be performed on the fourth day of life. The operation should be deferred in jaundiced infants and in infants weighing less than 5 pounds 8 ounces.

3. Routine performance of a dorsal slit results in negligible blood loss and permits an exact, measurable technique for the application of the Gomco clamp.

## REFERENCES

1. AL AKI, F. M.: New circumcision clamp. *Am J. Surg* 68: 402, June 1945
2. ATKINS, H. J. B.: Special circumcision forceps. *Lancet* 1: 610, March 14, 1936
3. BERTWISLE, A. P.: Juvenile circumcision: plea for standardized technique. *Lancet* 1: 85-86, Jan 12, 1935
4. BERRY, A. H.: New phimosis clamp. *J. A. M. A.* 48: 2116, June 22, 1907
5. BRODIE, E. L.: Circumcision. *Surgery* 5: 271-274, Feb 1939
6. CLARKE, B. G.: Circumcision dressing. *Am J Surg* 61: 129-130, April 1944
7. COLVIN, D. D., and BARTHOLOMEW, R. A.: Circumcision of newborn infant by cauterization. *Am J Obst. & Gynec* 45: 899-900, May 1943
8. HARRIS, H. H.: New instruments for circumcision; report on their use in 1,000 cases. *M. Rec.* 140: 441-443, Oct 17, 1934
9. MOSKOVICH, M. N.: Circumcision forceps. *J. A. M. A.* 74: 1167, April 24, 1920
10. PUGH, W. S.: Circumcision. *S. Clin. North America* 15: 461-470, April 1935
11. WALKER, W. W.: Electrosurgical circumcision. *Am J Surg* 7: 103-105, July 1929
12. WOLBARST, A. L.: Circumcision and penile cancer. *Lancet* 1: 150-153, Jan 16, 1932
13. YELLEN, H. S.: Bloodless circumcision of newborn. *Am. J. Obst. & Gynec.* 30: 146-147, July 1935



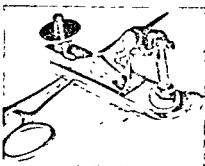


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the foreskin pulled up evenly around the cone with plain thumb forceps. Reaching through the hole in the plate with mosquito forceps, attaching sutures to the foreskin to pull it through the hole in the plate, or other complicated procedures are not necessary. When the plate and the cone are assembled properly and screwed firmly into place, the apex of the dorsal slit should be 0.25 cm. distal

to the margin of the hole in the plate as shown in figure 3.

After a 5-minute wait for pressure hemostasis, the foreskin is cut off flush with the margin of the hole in the plate. The clamp is then unscrewed, disassembled, and removed. As recommended by Walker (11) enough foreskin is left to cover the corona during relaxation of the penis (fig. 4). Figure 5 shows the foreskin retracted into the position in which it is left during the healing which prevents reforming of adhesions between the mucosa and glans.

The dressing used is similar to that described by Clarke (6) for adult circumcisions. The penis is wrapped in vaseline gauze and covered by a 4-inch square gauze pad, one layer of which contains a hole through which the penis is placed using the intact layer of gauze as a cover. The open ends of this dressing are tucked up under the infant's bellyband to complete the dressing.



Figure 4.

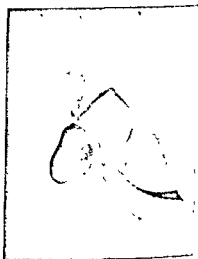


Figure 5.

## CONCLUSIONS

1. Circumcision of the newborn is indicated in all cases in which the foreskin cannot be readily dilated and retracted over the glans penis.

2. Circumcision should be performed on the fourth day of life. The operation should be deferred in jaundiced infants and in infants weighing less than 5 pounds 8 ounces.

3. Routine performance of a dorsal slit results in negligible blood loss and permits an exact, measurable technique for the application of the Gomco clamp.

## REFERENCES

1. AL AKL, F. M.: New circumcision clamp. *Am J Surg* 68: 402, June 1945
2. ATKINS, H. J. B.: Special circumcision forceps. *Lancet* 1: 610, March 14, 1936.
3. BERTWISTLE, A. P.: Juvenile circumcision, plea for standardized technique. *Lancet* 1: 85-86, Jan. 12, 1935
4. BOREY, A. H.: New phimosi clamp. *J A M A* 48: 2116, June 22, 1907
5. BRODIE, E. L.: Circumcision. *Surgery* 5: 271-274, Feb 1939
6. CLARKE, B. G.: Circumcision dressing. *Am J Surg* 64: 129-130, April 1944.
7. COLVIN, E. D., and BARTHOLOMEW, R. A.: Circumcision of newborn infant by cauterization. *Am J. Obst. & Gynec* 45: 899-900, May 1943
8. HARRIS, H. H.: New instruments for circumcision; report on their use in 1,000 cases. *M. Rec.* 140: 441-443, Oct 17, 1934
9. MOSKOVICH, M. N.: Circumcision forceps. *J A M A* 74: 1167, April 21, 1920
10. PUGH, W. S.: Circumcision. *S Clin North America* 15: 461-470, April 1937
11. WALKER, W. W.: Electrosurgical circumcision. *Am J Surg* 7: 103-105, July 1929.
12. WOLBARST, A. L.: Circumcision and penile cancer. *Lancet* 1: 150-153, Jan 16, 1932.
13. YEZLEN, H. S.: Bloodless circumcision of newborn. *Am. J. Obst. & Gynec.* 30: 146-147, July 1935.



nearly equal at all frequencies—fairly common); (c) falling curve (usually starting at 0 to 15 db for the frequencies 250 (256), 500 (512), and 1,000 (1,024) c/s<sup>2</sup> then dropping gradually or suddenly to levels greater than 20 db—very common); and (d) rising curve (the lower frequencies show the greater loss gradually rising to normal or slightly below normal—this type is relatively rare). Probably the most common exception to these classes is the pure tone audiogram with a normal curve, except for a dip at 4,000 (4,096) c/s varying from 20 to 60 db. This dip is of little or no significance. Another exception that is relatively rare is a U-shaped curve. It has normal values at each end of the sound spectrum, with values symmetrically falling in the middle and again symmetrically rising to normal.

The frequencies we are most concerned with in relation to speech are 500, 1,000, and 2,000 c/s. This is the speech range which extends from about 330 to 3,000 c/s. In general, if an average of these three frequencies is taken, the resulting figure will give a close approximation of the loss for speech in decibels. Hearing losses should be recorded as decibels of loss rather than in percentage. It is a mistake to attempt to interpolate between the 5 db steps on the audiometer since the resulting figure is merely a guess and it is not necessary to record steps of less than 5 db. If there is a question of the threshold not being as little as 30 and perhaps not as much as 35 db then 35 should be recorded.

Deafness may be classified as conductive, perceptive, and mixed. Conductive deafness is caused by a barrier to the conduction of airborne sound from the external ear through the middle ear to the cochlea. Any sound getting through to the cochlea is picked up, analyzed correctly, and carried to the central nuclei normally. Examples of this are otosclerosis, middle ear deafness, and foreign bodies in the external canal. Perceptive deafness is caused by malfunction of the receptive mechanism of the inner ear or any dysfunction of the auditory nerve trunk, cortical nuclei, and auditory area. Sound arrives at the cochlea normally, but at this point perception is faulty for both intensity and discrimination. Examples are deafness caused by acoustic trauma; toxic conditions such as quinine, nicotine, and streptomycin poisoning; meningitis; acoustic nerve tumors; Ménière's syndrome; presbycusis; and trauma to the auditory cortex. Mixed deafness is a combination of the preceding types.

In general, patients with a hearing loss in the better ear of less than 25 db in the speech range will have little difficulty performing military duty. There are patients, however, whose hearing loss lies between 20 and 30 db, who will complain of difficulty in situations which re-

<sup>2</sup> Cycles per second.

quire acute hearing, such as conferences, lectures, theaters, parties, and noisy places, particularly groups in which several conversations are carried on simultaneously. The treatment of this type of patient is also dependent on the amount of loss in the most severely affected ear. If the hearing is nearly equal in both ears difficulty will be less than if the poorer ear is much worse than the better ear. The treatment will be determined by the type of hearing loss also. A patient with a predominantly conductive loss will have relatively little trouble as compared with a patient with a perceptive loss, particularly if the pure tone audiogram shows a steep loss following 500 to 1,000 c/s.

This can be explained as follows: A patient with a conductive loss needs only an increased intensity to pass the obstruction to the airborne sound, after which the cochlea functions normally. In contrast, in perceptive deafness the cochlea is faulty, and although increased sound is perceived this sound is not analyzed correctly and the result is summed up by the statement, "I can hear you but I cannot understand what you are saying." Analyzing further, the vowels carry the strength of the words but discrimination is controlled by the consonants. The vowels are made up of frequencies below 1,500 c/s and the consonants above 1,500 c/s. This explains why some patients have more difficulty than others and why some words and voices are more easily understood than others.

Speech reception audiometry seeks a person's auditory threshold and discriminatory power for speech by the use of special word lists presented through a controlled amplification system. This may be conducted by a monitored live voice over earphones or in a sound-controlled situation without earphones. It has no relation to the low conversational voice or whispered voice tests.

After a diagnosis and evaluation have been made, and all definitive treatment has been accomplished with no improvement, rehabilitation is mandatory. Rehabilitation of the deafened soldier is a specialized job and should be attempted only by trained personnel. At present the Army has the world's finest center for rehabilitating deafened persons. Its purpose is to study, evaluate, and rehabilitate deafened soldiers in such a way as to make them useful to the Army. Any soldier who complains of difficulty with his hearing should be studied carefully and not pushed aside as a malingerer or chronic complainer. If an audiogram shows him to have a loss of 25 db or more in the speech range he should be sent to the Audiology and Speech Correction Center at Walter Reed General Hospital for study. Conversely, if his hearing loss is less than 25 db, or he has one ear with less than 25 db loss, there is no need for rehabilitation. Severe deafness in one ear, with better than 25 db in the good ear, will cause little or no disability; in the past  $2\frac{1}{2}$  years many patients have been sent to this

center needlessly because of ignorance of this fact. On the other hand, there are many who have not been sent here because of improper study or no study at all

This center has returned to duty patients of ranks from privates to lieutenant generals with benefit to the patient and to the military service. Patients often enter this clinic tired, bewildered, and psychologically beaten but leave after a few weeks with a new understanding of their problems and a completely renewed confidence in their ability to perform their military duties. It is now the policy of the Army to send back to duty any patient whose hearing is improved to 20 db or better by a hearing aid although these men cannot perform combat duty. The instrument would break down under combat conditions, but there is no reason why such men cannot do all other types of duty. It behooves the officers responsible for assigning these men to assign them to noncombat duty. Today's armies are highly specialized, and many men who have been deafened in the Army have experience that can be useful if they are properly assigned. On the other hand, these same soldiers without rehabilitation are less useful, and because of fear of disfavor from a misunderstanding superior officer may neglect to report their progressing disability.

The deafened person develops a peculiar psychology. He becomes an introvert and seeks to hide his disability. Many men who are deafened have been considered disciplinary problems because of failure to hear commands or instructions. Rehabilitation involves more than issuing a hearing aid that is nothing more than an amplifying system reduced to a convenient size. Because deafness is largely influenced by the patient's psychologic make-up and response to amplified sound, just any device will not answer the purpose. A fitting procedure is necessary to determine which, if any, of the numerous makes will give the best results as determined by controlled tests. After this the patient is given a training course in the use and care of the aid. This course is designed to show the patient how to get the most out of his instrument and to convince him that by its proper use he will overcome most of the difficulties he first encountered. Added to this are courses in lip reading, in increasing powers of observation, and in correcting speech defects. Each has its share of psychotherapy also.

This center is equipped to deal with any type of speech defect, including stuttering, aphasia, defects caused by articulatory dysfunction (whether traumatic or psychologic), defects resulting from deafness, and esophageal speech training after laryngectomy. The staff of this center has become expert in making decisions concerning the deafened soldier's ability to perform his military duties and with few exceptions any man returned to duty from this center can do mili-

tary duty if he so desires. Patients are routed to this center after being studied by the otolaryngologist of the referring hospital. If a patient is considered to have defective hearing within the limits previously outlined, application is made through the regulating medical officer, Office of the Surgeon General, for transfer to Walter Reed General Hospital. All problems regarding defective hearing must be decided by the Audiology Service, Walter Reed General Hospital (5).

## REFERENCES

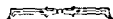
1. HOOPE, G. D.; WOLFF, W. C., and BREGA, S. C.: Unrecognized battle noise trauma. *Laryngoscope* 57: 125-136, Feb. 1947
2. FOWLER, E. P., SR.: Percentage of capacity to hear speech and related disabilities. *Laryngoscope* 57: 103-113, Feb. 1947
3. FOWLER, E. P., JR.: Extraneous factors in quantitative tests for hearing. *Acta oto-laryng.* 28: 283-304, 1940.
4. GLORIA, A.: Hearing evaluation by low conversational voice test. *Ann Otol Rhin. & Laryng.* 85: 394-402, June 1949
5. TB Med 195, and Special Regulation 40-530-5, and AFR 160-27, 7 October 1949.

Scrub Typhus in Assam and Burma <sup>1</sup>

The incidence of scrub typhus on the basis of case rates and isolation of rickettsial strains from chiggers and tissues varies in 9 areas near Leda, Assam. The percentage of chiggers that were *Trombicula deliensis* (Walch) in samples from these areas varied from 13 to 96 percent. *T. deliensis* was most prevalent at the 3 areas undoubtedly most dangerous with respect to scrub typhus, constituting 60, 74, and 96 percent respectively of all chiggers sampled, and was least abundant in areas reporting no cases and considered relatively less dangerous. Samples from the hypoinfective areas were most likely to consist entirely of *T. deliensis*. In one very dangerous area, 50 of 75 samples consisted entirely of this mite. In the less infective areas *T. deliensis*, reported in every batch of chiggers from which rickettsial strains were isolated, never appeared in more than 10 percent of the samples.

In the most dangerous area 12 mite strains were isolated in 30 attempts, and over 90.5 percent of the chiggers sampled were *T. deliensis*. In 46 instances, all the mites sampled were of this species. On the basis of abundance, its habits, and its chiggers, and because of the strains isolated from its chiggers and tissues, *Rattus flavipictus pumnanensis* is considered to be important in the epidemiology of scrub typhus in the Leda area. Shrews are involved in the epidemiology of this disease. Data were presented indicating that *T. deliensis* was more abundant on various species of rats taken in grassy terrain and scrubby growths along the roadside in North Burma than on hill-sides of the contiguous primary jungle. *T. deliensis* was much more prevalent in the wet season than in the dry season, although it was found throughout the year.

<sup>1</sup>TRICH, R.: Observations on tsutsugamushi disease (scrub typhus) in Assam and Burma. *Abstr. Am. J. Hyg.* 50: 361-370, Nov. 1949.





# Pathologic Features of Yellow Fever in Panama

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THE continuing occurrence of deaths from yellow fever among the native farming population in the Republic of Panama will afford an unusual opportunity to study the pathologic features of this disease, and to observe the involution of the liver lesion and the progress of the lower nephron (hemoglobinuric) nephrosis, when death is delayed.

Although an intensive rural vaccination program has been completed by the Health Departments of the Republic of Panama and the Panama Canal, the migration of farmers from many remote localities of the interior to the yellow fever zone, particularly to the newer agricultural settlements along the Transisthmian Highway, makes it difficult to eradicate the disease. One recent victim is known to have refused vaccination. Since the initial outbreak in November-December 1948, there have been three additional proved deaths from yellow fever among unvaccinated farmers working in new clearings or engaged in felling trees. Two of these occurred in August and one in September 1949. During the rainy season, and particularly in November and December, with the last flurry of insect activity before the dry season, an increase in deaths is anticipated. Specimens from all organs at autopsy are now being referred to the Board of Health Laboratory, Gorgas Hospital, for diagnosis and complete histologic examination.

Ranking high among the relatively recent discoveries pertaining to yellow fever is the characteristic microscopic liver lesion, one of the most pathognomonic histologic patterns to be seen under the microscope. Stoke's discovery that the virus of yellow fever could readily be transmitted to the *Macacus rhesus* monkey initiated the chain of events leading to the discovery of the sylvan origin of the disease. The modification of the technique of the Pfeiffer phenomenon to the mouse-protection test provided a practical diagnostic test

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and the development of an effective vaccine provided a practical control measure.

Of importance was Hoffmann's (1) recommendation, in 1928, that the histologic specificity of the liver lesion of yellow fever be made the basis of routine diagnosis. The pathologic findings in yellow fever may have been well known to a few investigators, but they certainly were not common knowledge. A clear description did not appear until 1929 when Penna and Figueiredo (2) stressed the differential diagnostic significance of the lesion. Klotz and Belt (3) summarized the liver findings in 1930. Councilman (4) had earlier described

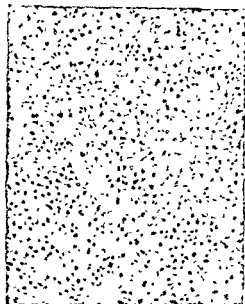


Figure 1.—Liver in delayed death. Councilman's material from necrotic polygonal cells being extruded into sinusoids.

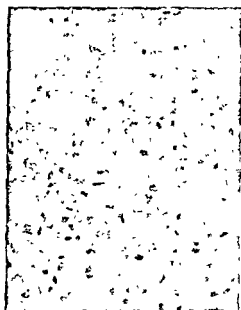


Figure 2.—High-power appearance of an area rich in Councilman bodies.

the characteristic liver necrosis that is now associated with his name, but he did not recognize the lesion as specific for yellow fever. In 1912, da Rocha Lima (5) described midzonal necrosis as characteristic of yellow fever, and this concept dominated the literature for many years without proper evaluation of the pathognomonic hyaline Councilman bodies. Implementation of Hoffmann's recommendation was effected in Brazil in 1930, and the diagnostic value of routine histologic examination of the liver was quickly established. The Viscerotomy Service of Brazil, Bolivia, and Colombia contributed materially to the discovery of the sylvan form of the disease when Soper, Rickard, and Crawford (6) observed its reappearance in the absence of *Aedes aegypti* mosquitoes in the rural area of Espirito Santo, Brazil, in March 1932, and in the isolated village of San Ramon, Bo-



Figure 3—Typical midzone necrosis in yellow fever



Figure 4—Peak of degeneration in Councilman bodies, with midzonal hemorrhage in liver lobules.

livia, in May 1933. The initial diagnosis of the recent Panamanian cases (7) was as easy as Hoffmann predicted in 1928, but was materially facilitated by familiarity with a slide prepared in 1941 from a Bolivian specimen and used since 1942 in a reference set on the pathology of tropical diseases. With such a guide the diagnosis was undisputable.

Histologically the gross pattern of the liver lobules is not materially disturbed although the cords are jumbled. Central veins and portal islands are readily distinguishable. There is no central necrosis that disturbs the outlines of the central veins. Necrosis involving the midzones of the lobules extends inward to two or three rings of cells bordering the central vein and to from one to four rows of cells which demarcate the perimeter of the lobules; these cells show minimal involvement. This necrosis is distinctive not only in its distribution, but also in its character. Councilman bodies, consisting of discrete hyaline-like eosinophilic masses of polygonal cell cytoplasm, are sprinkled in a salt-and-pepper fashion throughout the lobule, contrasting in color with the basophilic cytoplasm of the uninvolved cells and the remnants of partially involved cells (figs 1, 2, 3, and 4). Some polygonal cells show only partial hyaline necrosis without detachment of the eosinophilic portions of their cytoplasm.

The degree of this necrosis varies in different lesions. In some, practically no normal polygonal cells remain and the entire lobule is diffusely involved, including the central and peripheral rings of cells.



Figure 5.—Hemoglobin casts in collecting tubules of kidney in yellow fever.

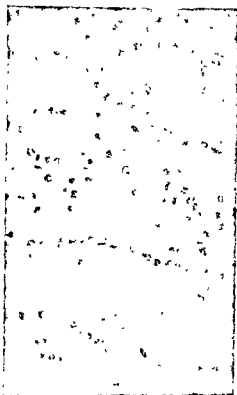


Figure 6.—Higher magnification of hemoglobin casts.

In others the necrosis is light and scattered, attaining its maximum density in the midzones. Polygonal cells showing the change in the Councilman bodies are usually wholly involved at the peak of the process—their shrunken nuclei often resembling a crescent on the cell edge, or the nuclei are missing. These cells appear as distinct, irregular, pink hyaline spheres or ovoids, and are often fragmented, resembling red blood cells. In the most recent involvement the liver shows midzonal hemorrhage, the red blood cells being distinguishable from the Councilman's fragments by their orange color.

Fatty degeneration is diffuse in character, but its degree in some cases varies inversely with the degree of degeneration of Councilman bodies, while in others the two degenerative processes coexist. There is some tendency for the fatty degeneration to spare the central zones. Nuclear inclusion bodies have not yet been demonstrated, presumably because of partial neutralization of the virus by the development of a protective antibody before death. Portal periductal and perivascular lymphocytic infiltration is common and may be associated with polymorphonuclear cell infiltration. In a recent case, in which death was delayed until the tenth day of illness, the superimposed factor of a peripheral zone necrosis with extensive polymorphonuclear cell infiltration accompanying the typical liver



Figure 7—Hoffmann body in a proximal convoluted tubule of kidney. This is a characteristic finding in yellow fever.

lesion was seen. In this case the kidneys also showed a fully developed lower nephron nephrosis, with the typical orange casts of hemoglobin (figs. 5, 6, and 7).

Although the liver lesion of yellow fever is described as specific and is not easily confused with other lesions, such as those of epidemic hepatitis, much still remains to be learned about it. It is curious that under certain circumstances in deaths from burns, a lesion said to be indistinguishable from it has been reported—an observation that may be of great importance in determining the pathologic changes in these entities (8). The mechanism whereby

the liver is cleared of Councilman's material (if the patient survives to the tenth day or longer, when the chief obstacle to recovery is the lower nephron (hemoglobinuric) nephrosis) is also deserving of careful study. In one of the cases occurring in August 1949, movement of this necrotic material into the sinusoids was noted exactly as Councilman described it in 1890. The first case in the series reported by Elton and Herrera (7) did not present a typical histologic liver lesion, yet conformed epidemiologically, clinically, and pathologically with yellow fever. Future studies may throw light on the existence of possible anomalies in the histologic pattern of the entity or, perhaps, of other viral diseases simulating yellow fever in all respects except for the liver lesion.

#### REFERENCES

1. HOFFMANN, W. H. Diagnosis of endemic yellow fever. *Am J Trop Med* 8: 563-568, Nov. 1928.
2. PENNA, O. and DE FIGUEIREDO, B. Contribuição ao estudo da his-to-patologia do fígado na febre amarela. *Folha med* 10: 220-223, July 15, 1929.
3. KLOTZ, O., and BELT, T. H. Pathology of liver in yellow fever. *Am J Path* 6: 663-688, Nov. 1930.
4. COUNCILMAN, W. T. Report on etiology and prevention of yellow fever. *U S Marine Hospital Service*, 1890. p. 151.
5. DA ROCHA LIMA, II. Zur pathologischen Anatomie des Gelbfiebers. *Verhandl. d. deutsch. path. Gesellsch.*, 1912. p. 163.
6. SOPER, F. L., RICKARD, E. R., and CRAWFORD, P. J.: Routine postmortem removal of liver tissue from rapidly fatal fever cases for discovery of silent yellow fever foci. *Am J Hyg* 19: 549-560, May 1934.

7. ELTON, N. W., and HERRERA, J. M.: Pathology of yellow fever in 1948 out break of sylvan form in Panama, scientific proceedings. *Am J Path* 25: 772-774, July 1949.
8. BELT, T. H.: Liver necrosis following burns, simulating the lesion of yellow fever. *J. Path. & Bact* 48: 493-498, May 1939.



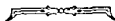
EXPLORATIONS INTO THE PHYSIOLOGIC BASIS FOR THE THERAPEUTIC USE OF RESTRICTIVE BANDAGES IN THERMAL TRAUMA. AN EXPERIMENTAL STUDY, by Frederick W. Rhinelander, M. D.; John L. Langohr, M.D.; and Oliver Cope, M.D. *Archives of Surgery* 59: 1056-1069, Nov. 1949.

Many authorities have advised pressure dressings and plaster casts for the local treatment of burns because these tend to limit swelling of the wound or, as in the case of plaster casts applied immediately after injury, prevent swelling without interfering with arterial blood flow, oxygenation, or nutritional environment of the tissues. Occlusive pressure dressings restore tissue pressure which is normally dependent upon an intact integument. Thus, pressure dressings aid venous return flow and limit both venous and lymph stasis. Pressure dressings are of value in preventing loss of plasma from the circulation, promote comfort, and so reduce the incidence of wound infection.

The experimental work of the authors emphasizes the clinical benefit derived from pressure dressings, but points out that although such treatment probably reduces the loss of plasma into the burn wound their findings were not conclusive. They noted that plasma from a burn wound is not sufficiently reduced by a plaster cast for the lymphatics to be able to carry and return it all to the blood stream. The lymph therefore piles up in the interstitial spaces proximal to the cast, and edema slowly reaches the volume it would have been had plaster cast dressing not been applied.

The clinical benefits which accrue from the use of restrictive dressings come from the immobilization of the wound. Motion of the burn wound increases the lymphatic flow and displaces edema proximally in the interstitial spaces; both have the effect of lowering tissue pressure in the wound and permit augmented seepage from the capillaries.

Restrictive immobilizing dressings are indicated in the care of burn wounds but they must not be used with the idea that the need of plasma to prevent shock will be reduced. The improper application of a plaster dressing carries with it the danger of gangrene.—*Abstract*.



# About the Army Medical Department

PAUL I. ROBINSON, Colonel, MC, U. S. A.<sup>1</sup>

**I**N a previous article<sup>2</sup> a report of a visit to a number of stations in the United States was made. The questions that were asked by Medical Department personnel at that time were tabulated and answered in the light of current knowledge. Subsequent correspondence indicated that personnel in those places not visited also had many of the same questions in mind and appreciated the discussion. We have recently paid a similar visit to medical installations in Hawaii and the Far East. In Hawaii, the entire medical service for the Army is rendered by Tripler General Hospital. The Navy and Air Force have small dispensaries from which consultations and patients needing hospitalization are sent to Tripler General Hospital. Army, Navy, and Air Force officers compose the staff at that hospital. The excellent working relationship between them leaves little to be desired. Congeniality and cooperation in professional as well as administrative relations were abundantly in evidence. A council composed of senior medical officers of the Army, Navy, and Air Force meets periodically to iron out minor difficulties and to formulate operating policies.

In Japan, the medical service is widely dispersed, corresponding to the distribution of troops. All hospitals, with one exception, are in permanent prewar buildings, many of which were originally constructed as hospitals. The medical service, without exception, was of the highest order. The relationship between Medical Department personnel and commanders whom they served was beyond reproach. Commanders everywhere had the highest praise for their medical service. Wives of officers and enlisted men in Japan were well satisfied if not enthusiastic about their living conditions. Much has been done in the way of stocking post exchanges with the necessities of life from the United States. A busy social life is carried on and a reasonable amount of household help is available. Many of the wives have

<sup>1</sup> The Personnel Division, Office of the Surgeon General.

<sup>2</sup> Bulletin of the U. S. Army Medical Department, May 1940, pp. 271-274.

taken great interest in Japanese culture and their conversation is most stimulating. Many have obtained, for reasonable prices, rugs, silverware, china, and cloisonné, damascene, and lacquer articles produced in Japan or China.

In Okinawa there is a scarcity of permanent buildings but construction is in progress. Nowhere is one confronted by a greater challenge to accomplishment. The spirit with which the personnel there are working to improve conditions is heartening. Attractive surroundings and efficient service must surely result from their endeavors. The wives there have entered into this spirit and are proving themselves a credit to their heritage.

In the Philippines, Army and Air Force medical personnel are jointly rendering medical service at Clark Air Force Base. Army units are rapidly finishing their work and leaving the Philippines. The Army continues to operate a hospital at Fort McKinley for the Philippine Scouts. All personnel continue to enjoy their service in the Philippines as they have in the past.

Our Navy operates the only hospital in Guam, and Army and Air Force medical personnel serve on the staff of this hospital. Army dispensaries are operated by Army medical personnel in an efficient manner and consultations are referred to the naval hospital. Morale is high and the joint operation is completely successful.

Medical personnel who so desired were interviewed at every station visited. Many had personal problems and no attempt will be made to enumerate them, although many others may have similar problems. Some of the questions of a general nature are discussed here.

Q. What will be the result of the closure of hospitals in the United States on the training program?

A. There are sufficient approved spaces in the remaining hospitals to accommodate all residents and interns. Coming in the middle of a training period—since only emergency cases could be admitted after 15 February 1950—the personal inconvenience of some officers in the program was unavoidable. The Army can fulfill its commitments to everyone in the program who is selected to advance and to everyone selected to enter the program in July 1950.

Q. What has been the reaction of the residents who are to be taken out of the training program and sent overseas for 3 months this summer?

A. Information from all of the hospitals indicates that quotas for each of them were filled with volunteers. Each officer will re-enter the program when he returns and, if he qualifies, will stay until he completes his training. The Department of the Army General Staff and the staffs of overseas commands have considered this solution to



the medical problem of this summer a commendable one. We expect all of these young officers to have a professionally profitable service as well as an interesting trip.

Q. Can officers who transferred to the Air Force transfer back to the Army if they desire?

A. Yes. Transfers of personnel between the Army and Air Force were extended by Public Law 216, Eightieth Congress, for 1 year. This means that until 26 July 1950 transfers are legally authorized. Agreement between the Army and Air Force on each transfer is required. More than 100 transfers have been made since passage of the law.

Q. Are transfers between the Army and Navy so authorized?

A. No. If one desires to come into the Army from the Navy, or vice versa, it is necessary that he resign his commission and apply for a commission in the other service. There is a tacit understanding between all the services that resignation from a Reserve commission to accept a Regular commission in any of the services will be approved. The applicant should specify his preference of service.

Q. What is the status of the legislation to allow nurses over 35 years of age to enter the Regular Army if they have had several years of active duty?

A. This bill has been passed by the House of Representatives and it is expected that it will pass the Senate before adjournment. If passed as currently written, it will authorize a qualified nurse to enter the Regular Army if she entered on active duty prior to 16 April 1947 under the age of 35 years and either served continuously on active duty to the current date or was separated subsequent to 12 May 1945.

Q. What is the status of the legislation to allow women doctors, dentists, veterinarians, and allied medical specialists to be commissioned in the Army Medical Department?

A. This bill also has passed the House of Representatives and it is hoped that it will pass the Senate before adjournment this year. Difficulties in coordination of this bill have resulted from the fact that the Navy, while it had no objection to the Army and Air Force having this authority, did not desire to participate in its provisions. Oddly enough, the Navy, under the legislation act pertaining to the WAVE, may commission women doctors in the Navy and permit them to have some of the privileges of other medical officers. The Army cannot do this under the legislation pertaining to the WAC.

Q. Why are not the tours of duty in overseas stations the same for nurses of all three of the Armed Forces?

A. This question might be broadened to include all personnel. The Army, Navy, and Air Force each determine the length of stay in overseas station for their own personnel. For women components,

however, special conferences have been conducted in the Office of the Secretary of Defense to determine if it is feasible and desirable to set uniform tours that may vary from those of male officers and enlisted men; and it has been recommended that women in each of the departments should serve the same tours as the male personnel of their respective service.

Q. Is it possible for a medical officer to extend his tour of duty for 1 year in Europe?

A. There is a policy that an officer must serve for 1 year in the United States before being returned to an overseas station. Because of the general shortage of doctors and dentists, however, it is likely that exceptions could be made in their cases. Anyone desiring to extend his tour should write to the Office of the Surgeon General in order that exceptions may be requested and instructions can be given him.

Q. Why do promotion criteria often discriminate against an officer? For example, an officer might be in the zone of consideration for promotion if he were a Reserve officer on active duty rather than a Regular Army officer.

A. It is fully realized that such cases do occur each time a zone of consideration is announced. The officers most affected are those, who though highly deserving, were denied promotion during the war simply because of limitations imposed by Tables of Organization or Distribution. To comply with existing regulations, it is required that Regular Army officers be arranged on a roster in order of their permanent seniority and non-Regular officers in order of their temporary rank. Based on the estimated vacancies, the zone of consideration for each of these two rosters is established. The number of Reserve and Regular Army officers included in the zone of consideration must be in direct proportion to the total number of officers of each group. By requiring Regular Army officers to have a specific number of years for promotion purposes, plus a specified date of rank, the most senior officers, from the standpoint of permanent grade, are considered for promotion prior to their juniors. To extend a zone of consideration to include Regular Army officers who would meet the Reserve criteria would disrupt the Regular Army promotion sequence, thereby creating a situation that probably would be even less desirable than the present system. In the long run, probably fewer officers will be discriminated against by the rigid application of the present limitations. In other cases Reserve officers appear to be discriminated against. All cases of apparent inequity arise from the promotion policies extant during the war when centralized control was not maintained.

Q. What are the possibilities of Reserve Medical Service Corps officers remaining on active duty in the future?

A. All Medical Service Corps officers must decide before the termination of their present categories whether or not they will apply to accept the grade of master sergeant. The Pharmacy, Supply and Administrative Section in the Regular Army Medical Service Corps is filled and only a few are commissioned each year through the medium of competitive tours. There will be a need, however, for as many Reserve officers on active duty as Regular Army officers in this section for many years to come. Each officer should look critically at his own case and make up his mind about his future. Some will have a good chance of serving for many years and at the same time receive training that will be to their advantage when they return to civil life. Others should consider accepting the grade of master sergeant. Still others may have an opportunity of completing a career on officer status.

Q. What will be the future assignments for physical therapists, dietitians, and occupational therapists in the United States now that so many hospitals are to be closed?

A. With the closing of the hospitals it will be necessary that transfer of all but the most difficult of medical cases to the general hospitals be curtailed. The training program is beginning to produce physicians, nurses, and women specialists in such quantities that more complete medical care can be given in certain station hospitals. There are few Army hospitals of less than 250 beds left. There is every indication that Army medical practice in the future will be one of the most ideal group practices existing anywhere in the medical profession, wherein all components of the Medical Department will be represented in almost every station hospital.



## BOOK REVIEWS AND BOOKS RECEIVED



Publishers submitting books for review are requested to address them as follows:

The Editor,

UNITED STATES ARMED FORCES MEDICAL JOURNAL,

Bureau of Medicine and Surgery, Navy Department,  
Washington 25, D. C.

(For review)

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HELP YOURSELF TO BETTER SIGHT, by Margaret First Corbett. 218 pages. Prentice-Hall Inc., New York, N. Y., publishers, 1949. Price \$2.50.

This book, intended for lay persons, is a plug for the Bates method of treating refractive errors without glasses. Despite impressive testimonials this method is based on certain premises which, if not wholly unsound, are highly controversial. Chief among these is the idea that the eye may accommodate to near and distant vision through changes in the shape of the eyeball effected by the *extrinsic* ocular muscles. The advice to expose the eyes to direct sunlight ignores the evidence that such exposure predisposes to the formation of cataracts. Our orthodox ophthalmologists agree that the doctrine of relaxation, general and ocular, has much to commend it and that it may benefit selected patients, but the author in her enthusiasm gives no indication that there should be any selection of patients or that harm might result from the application of this method to some patients. In fact, claims are made that the methods employed have cured strabismus, astigmatism, presbyopia, subtotal blindness, and color-blindness with deafness thrown in for good measure. The pay-off occurs on page 186 where the highly esteemed Ishi Hari charts are referred to as a clever bit of subversive work designed primarily not to detect color-blindness but to keep healthy American men out of our Armed Forces! The book has no index.—Lt. Col. W. G. Brandstadt, MC, U. S. A.

AN INTRODUCTION TO ZEN BUDDHISM, by Daisetz Teitaro Suzuki, D. Litt., *Professor of Buddhist Philosophy in the Otani University, Kyoto*. Foreword by C. G. Jung, M. D., LL. D., D. Litt., D. Sc. 176 pages. The Philosophical Library, New York, N. Y., publishers, 1949. Price \$3.75.

Dr. Suzuki is the greatest living authority on Buddhist philosophy in general and Zen Buddhism in particular. Republication of this book, written in 1934, is part of a project to republish all his works, new and old, because none have been available since the war. Dr. C. G. Jung, in a 20-page foreword, paves the way by attempting to allay the Western mind of mis-conceptions. Suzuki

attacks the problem by showing first what Zen is not. He then attempts to present the positive side of the picture, but Westerners find Zen so difficult to grasp that other and more comprehensive works must be digested before an adequate understanding is reached—*Col W. F. Bourcers, MC, U. S. A*

**ALLERGY IN THEORY AND PRACTICE** by Robert A. Cooke M. D., Sc. D. F. A. C. P. *Attending Physician and Director of the Department of Allergy, the Roosevelt Hospital New York City in association with Horace S. Baldwin, Robert Chobot R. Clark Grove, Joseph Harkavy, Selman Hebal, Michael Heidelberger, Paul Klempner, Louis Schwartz, W. C. Spain, Dudley D. Stetson, Albert Vander Veer, Mathew Walker and Margaret B. Strauss.* 572 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1947. Price \$5

This book, written by one of the foremost practicing allergists in this country in conjunction with many associates, is an excellent textbook. The early chapters rapidly review the fundamental facts and experiments in immunology which form the basis for the present concepts of allergic mechanisms and clinical diseases. An earnest attempt is made to point out the gaps in our knowledge and to stimulate interest in further research.

The importance of a careful complete history in all allergic conditions is stressed, and there is an excellent section on skin testing, its techniques, interpretation of reactions, and limitations.

Each of the common allergic conditions is covered. The section on bronchial asthma is outstanding and that on allergic dermatitis very good. The presentation of the material in the chapters on allergic rhinitis could have been improved.

It is worth noting that this book very definitely emphasizes opinions of the authors and only occasionally is there mention of other points of view. However, for the young medical officer in the service without special training who is forced by circumstances to treat allergic patients, this volume can be recommended most highly—*Lt Col W. H. Diersner, MC, U. S. A*

**THE STORY OF SCABIES** Volume I  
Treatment of Scabies and its  
to the Beginning of World War  
of Dermatology and Syphilis  
of the College of Physicians of Philadelphia Member of the Philadelphia Dermatological Society, American Academy of Dermatology and Syphilology, Society for Investigative Dermatology and American Association of the History of Medicine, Corresponding Member of the Italian Society of Dermatology and Syphilology and  
ht M. D.  
Medicine  
ork N. Y.

Dr. Friedman, who is an international authority on the subject of scabies, has collected in volume I of a projected series of four volumes, material previously published in 1941 and 1942. Future volumes will be devoted to more recent advances in the study of Scabies Since World War II; The History of Scabies, and Classical Descriptions Relating to the Mite as Well as the Disease.

The reader never ceases to be amazed at the meticulous detail of Dr. Friedman's study of a disease and its causative acarina. There are extensive excerpts of descriptions of the mite, the disease, and the treatment from the earliest medical records available relating thereto, with astute conclusions as to their accurate or inaccurate relationship to the subject.

Volume I of the series will appeal primarily to the medical historian and the student of entomology. The dermatologist will learn much of the history of his specialty by reading this work as scabies has held the limelight in dermatology until recent times.

The style makes pleasant reading, the illustrations are excellent but some of the tables are poorly produced.—*Lt. Col. F R Hirschmann, MC, U. S. A.*

**THE PRACTICE OF REFRACTION**, by Sir Stewart Duke-Elder, K C V O M A, D Sc (St. And.), Ph. D. (Lond.), M D, F R C S Hon D S C (North Western) *Surgeon-Oculist to H. M. The King; Knight of Grace of the Order of St. John Consulting Ophthalmic Surgeon to the Army and the Royal Air Force Director of Research, Institute of Ophthalmology, University of London, Consulting Ophthalmic Surgeon, Moorfields Westminster and Central Eye Hospital, Ophthalmic Surgeon, St. George's Hospital.* 5th edition. 317 pages with 216 illustrations. The C V Mosby Co., St. Louis, Mo., publishers, 1949. Price \$6.25

In his typical straightforward style, the author presents the basic principles of physiologic optics and of their interpretation in the human eye. He then discusses the common errors of refraction; the anomalies of refraction; eye muscle imbalance; and the various clinical examinations of the patient that should be performed in a complete refraction.

The final chapter, on the making and fitting of lenses, is well done, especially the concise appraisal of the present day status of contact lenses.

One of the deficiencies of this volume is the lack of a bibliography, which is so necessary in a book that covers most subjects in a rather matter-of-fact manner, when in reality much difference of opinion exists concerning many of the topics under discussion.—*Capt. A. J. Delancy, (MC) U. S. N.*

**KAYNE, PAGEL, AND O'SHAUGHNESSY'S PULMONARY TUBERCULOSIS**, Pathology, Diagnosis, Management and Prevention, revised and partly rewritten by Walter Pagel, M. D., *Pathologist, Central Middlesex County Hospital, London*, F. A. H. Simmonds, M. A., M. D., D. P. H., *Medical Director, Clare Hall County Hospital, Middlesex*, N. MacDonald, M. B., M. R. C. P., Ed., *Physician to the Chest Clinic, Redhill County Hospital, Middlesex*; and L. Fatti, F. R. C. S., *Thoracic Surgeon, Hillingdon County Hospital and Harefield County Hospital, Middlesex.* 2d edition. 720 pages, illustrated. Geoffrey Cumberlege, Oxford University Press, New York, N. Y., publishers, 1948. Price \$18.50.

This comprehensive treatise reflects the opinions of the pathologist, medical man, and surgeon. It deals extensively with pathogenesis, diagnosis, and general management, and less with matters of prognosis and epidemiology. The exhaustiveness of the discussion and bibliography, the clinical and experimental pathology cited, the descriptions and illustrations of specialized techniques, place this book beyond the sphere of reference literature for the medical student, general practitioner, and surgeon.

The first part deals mainly with the pathogenesis of tuberculosis, both primary and "post-primary." The importance of the primary lesion in recurrence of active disease is stressed, as is the relation of pulmonary and extrapulmonary forms.

The various forms of pulmonary tuberculosis observed are well documented by case histories and reproductions of roentgenograms.

The following conditions are discussed in the differential diagnosis (and concurrence with tuberculosis): pneumonitis, bronchiectasis, chronic bronchitis, lung abscess, pneumoconiosis, cancer, and sarcoidosis.

Under treatment, the value of streptomycin is assessed, collapse therapy is most extensively discussed, although the medical regimes in common use are not overlooked. Pathologic physiology is discussed in connection with cavities, noncavitary lesions, and atelectasis. Artificial pneumothorax, intrapleural pneumolysis, phrenicectomy, artificial pneumoperitoneum, and thoracoplasty are evaluated. Cavity drainage and extirpative measures are touched upon. The chapter on choice of procedures is of value.

From the public-health standpoint the measures for prevention and control include: segregation of active cases, pure milk supplies for children, BCG vac-

cination for children and adults who may be exposed to active cases, and periodic tuberculin testing and radiographic studies are discussed.

The appendices include the classifications used by the Ministry of Health in Great Britain, and the National Tuberculosis Association in the United States.—*Lt. (jg) P. W. Meyer, Jr., (MC) U S N*

**GERIATRIC MEDICINE, The Care of the Aging and the Aged.** Edited by Edward J. Stieglitz, M S M D F A C P, *Attending Internist, Suburban Hospital Bethesda, Md (Chairman, Staff, 1915-47); Doctor's Hospital, Washington, D C Attending Internist (Geriatrics) Chestnut Lodge, Rockville, Md, Consulting Internist Washington Home for Incurables Associate, Washington School of Psychiatry Special Lecturer Institute of Industrial Medicine, New York University Bellevue Postgraduate Medical School New York City Formerly Associate Clinical Professor of Medicine Rush Medical College The University of Chicago* 2d edition. 772 pages, illustrated. W B Saunders Co Philadelphia, Pa., publishers, 1949. Price \$12.

In the second edition of this standard reference book, Dr. Stieglitz has presented the problems of caring for the aging and aged. He has added and integrated the talents of 46 distinguished collaborators, each an authority in his own field, thereby providing a more comprehensive discussion of the biology of aging.

The achievements of preventive medicine in controlling infectious diseases and the benefits of improved infant care have conferred a longer life expectancy upon our population. The problems of this "aging population" are dealt with in essay style, system by system, and disease by disease.

The belief that arteriosclerosis is a natural accompaniment of aging is no longer tenable in light of present knowledge. This problem is discussed clearly by Dr. Irving S. Wright.

Other diseases of stress and degeneration are considered with the suggestion implicit that preventive medicine might well prepare and redirect its energies toward problems in the field of geriatrics, long neglected and long considered to be irreversible and irreparable.

As with any medical work, there are unwritten chapters, for progress in the field of endocrinology has outstripped the pace of the printer. Other sources must be sought for a view of the forward moving scene involving ACTH, cortisone, the Selye hypotheses, and other pertinent correlations.

To all readers in search of an introduction to the very important medical problems incident to the care of the aging and the aged, this book is a rich storehouse of information, presented in a clear and concise manner.—*Commander G. L. Calry, (MC) U S N.*

**REFRACTION OF THE EYE,** by Alfred Cowan M D, *Professor of Ophthalmology Graduate School of Medicine, University of Pennsylvania Active Consulting Ophthalmologist, Philadelphia General Hospital, Consulting Ophthalmologist, Council for the Blind and Supervising Ophthalmologist of the Department of Public Assistance, Commonwealth of Pennsylvania* 2d edition, thoroughly revised, with 187 illustrations and 3 colored plates. Lea & Febiger, Philadelphia, Pa., publishers, 1949. Price \$5.50

This work accomplishes the author's purpose in that it is "a book on clinical refraction employing the theory of ophthalmic optics in such a way that clinical aspects would emerge logically and in orderly sequence from their bases of scientific facts."

The illustrations are excellent, especially the three colored plates. All these help in the logical sequence of proof presented by the author for the laws of refraction and reflection.

The early chapters deal with light and its propagation; laws of reflection and laws of refraction, with mathematical proof for a pencil of light as it is affected by reflecting surfaces, prisms, thin and thick lenses of various forms—including

optical lenses, as well as the eye contents (cornea, aqueous, pupil formed by the iris, lens, vitreous, and retina). A recapitulation of laws of optics is presented summarizing each chapter. The chapter on ametropia is excellent in its presentation of theory, fact, and explanation. Methods of refraction are well explained, giving procedure and description of equipment necessary in performing the various phases of different methods, both objective and subjective. The prescribing of lenses for measuring visual acuity is delineated in logical steps with a discussion of the various special types of lenses, contact glasses, and telescopic spectacles.

A large bibliography with a complete index closes this well-prepared book. It will be a temporary closing only, for the student or ophthalmologist will find his memory refreshed with precisely illustrated facts. He will use it later as a reference for proof in refraction as it affects the human eye.

This third edition of Cowan's *Refraction of the Eye* should replace older volumes, especially in our teaching centers because many concepts of clinical aspects as well as scientific data have changed since the last edition. Present concepts as found herein are now used in teaching at the American Academy of Ophthalmology and Otolaryngology as well as in home study courses covering the field of ophthalmology. This newer knowledge is necessary in order to pass the American Board examinations.—*Capt. C. B. Johnson, (MC) U. S. N.*

**PEDIATRIC ANESTHESIA**, by M. Digby Leigh, M. D., *Director of Anesthesia, Vancouver Hospital, Vancouver, Canada; Diplomate of the American Board of Anesthesiology. Formerly Director of Anesthesia, Children's Memorial Hospital, Montreal, Canada. Formerly Assistant Professor of Anesthesia, McGill University, Montreal, Canada; and M. Kathleen Belton, M. D., Supervisor of Pediatric Anesthesia, Vancouver General Hospital, Vancouver, Canada; Formerly Assistant Director of Anesthesia, Children's Memorial Hospital, Montreal, Canada; Formerly Demonstrator in Anesthesia, McGill University, Montreal, Canada.* 240 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1948. Price \$5.50.

Doctors Leigh and Belton have drawn upon their extensive clinical experience to write a book which is well organized, easily read, and a "must" on the library list of every anesthesiologist.

It is only in the past few years that we have to come to recognize and understand more fully the differences between adult and child physiology, differences which are of the utmost importance to the anesthetist. The greater metabolism of the child makes him less able to tolerate extremes of anesthesia or oxygen lack. The authors point out these differences and their significance so far as margin of safety is concerned, particularly in their discussion of respiration and circulation.

The proper psychological approach assumes greater significance when dealing with children, and the preoperative visit and medication are given considerable attention in this book. Optimal drug dosage for adequate premedication is presented.

All the various techniques of anesthesia are discussed, and there is a very comprehensive chapter on the choice of anesthetic agent and technique. Inhalation anesthesia is emphasized, particular reference being made to the use of Ayre's T tube and a valve which allows inhalation of atmospheric air. Indications for intubation and the disadvantages of this technique are given. More might have been said about the use of curare in pediatric anesthesia.

Special chapters are devoted to complications, postoperative care, and oxygen and fluid therapy.

This book deserves unqualified recommendation because of its excellent coverage of a specific field within that of anesthesiology.—*Lt. (jg) B. H. Pender (MC) U. S. N.*



**DENTISTRY IN PUBLIC HEALTH** edited by Walter J. Pelton, D. D. S., M. S., P. H., Dental Surgeon, U. S. Public Health Service, Colorado, and Jacob M. Wisan, D. D. S., M. S., P. H., Director, Joseph Samuels Dental Clinic, Rhode Island State Hospital for the Dental Health Section of the American Public Health Association. 367 pages, illustrated with 64 figures. The W. B. Saunders Co., Philadelphia, Pa. publishers, 1949. Price \$5.50.

Forces generated by the pressure of accumulated knowledge shape the course of events in all fields of endeavor. It is in response to such forces in the field of public health that Pelton and Wisan have contributed a most interesting and highly significant composite text.

This book constitutes a compilation of material derived from authoritative sources, all of which is relevant to dentistry's current status in the sphere of public health. It is composed of 17 chapters covering 352 pages, with 64 figures, and is well indexed for ready reference. Each chapter has a comprehensive bibliography which may be used by readers to obtain detailed information with regard to the subject matter.

The introductory chapter by Louis S. Reed, Ph. D., sets the stage by the portrayal of sociologic trends and developments affecting all health services, thus providing the necessary background by a description of the medical health plans which have been sponsored and/or adopted by medical groups and governmental agencies. Logical continuity then progresses to a consideration of "Dentistry in the Public Health Movement," a chapter presented by William R. Davis, D. D. S., Melvin L. Dollar, B. S., and Hugo Kulstad, D. D. S., deal with the "Economic Aspects of the Dental Health Problem" as related to dental needs and the cost and demand for dental care. Mathematical principles quantitatively applied to biologic materials, dental biometrics, constitute a masterful chapter written by Marguerite Hill, Ph. D. This material will have special appeal to research workers and dentists who are interested in a critical analysis of problems in the dental health field.

John W. Knutson, D. D. S., Dr. P. H., gives a clear word picture of the methodology involved in making statistical surveys and in evaluating various types of dental programs. Nina Simmonds, Sc. D., a prominent nutritionist, narrates the story of nutrition, beginning with a brief historical background which leads to the Present Concept of Food as a Factor in Dental Disease. Included in this narrative is a tabulation of 7 groups of foods suitable for checking the adequacy of patients' diets. Philip Jay, D. D. S., M. S., Sc. D., depicts the modality of clinical laboratory tests for determination of caries activity.

Fluorine, scientifically considered from the viewpoints of early and recent research, is exceptionally well presented by two prominent investigators and writers in the field of public health, H. Trendley Dean, D. D. S., and Francis A. Arnold, Jr., D. D. S. The former concerns himself with epidemiological characteristics of fluorosis, while the latter deals with fluorine in its systemic, oral, environmental, experimental, and control aspects.

Philip Blackerby, Jr., D. D. S., M. S., P. H., reports the development, current status, and trends of treatment in public health dentistry on the National, State, and local levels. The definition, need, and methodology of dental health education is succinctly recounted by Dorothy B. Nywander, Ph. D.

A general review of administrative problems in dental health programs and the manner in which dentistry fits into the operation of health departments is sketched by Walter J. Pelton, D. D. S., M. S., P. H. This review of general considerations is supplemented and amplified by delineation of local dental health programs aptly described by Allen O. Gruebel, D. D. S., M. P. H.; dental programs in urban communities by Harry Strasser, D. D. S., M. S., P. H.; and State dental programs by Frank C. Cady, D. D. S., M. P. H. A concluding chap-

ter by Harold Hillenbrand, D. D. S., briefly describes the principal dental professional Associations and Foundations

America today is undoubtedly more sociologically inclined than at any previous time in its history. Transitory influences characteristic of postwar eras, capable of profoundly affecting the health of the Nation and the status of the health professions should be critically evaluated in the light of present knowledge. Members of the health professions should familiarize themselves with the contents of this book in order to have an intelligent concept of current influences in order to supply the leadership necessary to serve the best interests of their country and their profession—*Capt. M. M. Mazurch, (DC) U. S. N*

**RADIOLOGIC EXPLORATION OF THE BRONCHUS**, by S. di Rienzo, M. D. *Assistant Professor of Radiology and Physiotherapy, Chief of the Radiology Department of the Institute of Cancer, The University of Córdoba, Argentina* Translated by Thomas A. Hughes, M. D., with a foreword by Richard H. Overholt, M. D. 332 pages. Illustrated. Charles C Thomas, Springfield, Ill., publisher, 1949. Price \$10.75.

This book should be of value to the radiologist, physician, and surgeon, because it stresses the assistance of good bronchography in both the diagnosis and precise localization of pathologic lung changes. The fact that the book contains numerous typographical errors and that some of the terminology is strange to the North American student should not detract from its over-all value. In the discussion of both normal and pathologic conditions, the dynamics of the respiratory tree as revealed by the bronchographic procedure are continually emphasized. The book is profusely illustrated.

## BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, these will be reviewed at a later date.

**JORDAN-BURROWS TEXTBOOK OF BACTERIOLOGY**, by William Burrows, Ph. D. *Professor of Bacteriology, Department of Bacteriology and Parasitology, the University of Chicago* With the collaboration of Francis Byron Gordon, Ph. D., M. D. *Biological Department, Chemical Corps, Camp Detrick, Maryland; formerly Professor of Bacteriology, Department of Bacteriology and Parasitology, the University of Chicago*; Richard Janvier Porter, Ph. D. *Associate Professor of Parasitology, School of Public Health, the University of Michigan*; and James William Moulder, Ph. D. *Assistant Professor of Biochemistry, Department of Bacteriology and Parasitology, the University of Chicago*. 15th edition. 951 pages. Illustrated with 264 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$9.

**THE VERTEBRATE BODY**, by Alfred Sherwood Romer, *Alexander Agassiz Professor of Zoology, and Director, Museum of Comparative Zoology, Harvard University*. 642 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$5.50.

**HISTOPATHOLOGY OF THE SKIN**, by Walter F. Lever, M. D. *Instructor in Dermatology, Harvard Medical School; Assistant Dermatologist, Massachusetts General Hospital, Associate in Dermatology, Peter Bent Brigham Hospital, Consulting Dermatologist, Massachusetts Eye and Ear Infirmary*. 449 pages; 221 illustrations, including 8 subjects in color on 4 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1949. Price \$10.

**PHARMACEUTICAL COMPOUNDING AND DISPENSING**, Editor in Chief Rufus A. Lyman, M. D. *Technical Editor George C. Lang* of *History of Pharmacy*; Professor *revision*, with 6 advisory editors and illustrated. J. B. Lippincott Co.

**HUMAN PATHOLOGY**, by Howard T. Katsner, M. D., LL. D. *former Professor of Pathology, Western Reserve University; Medical Research Advisor to the Bureau of Medicine and Surgery, United States Navy*. 7th edition. 927 pages; 562 illustrations in

black and white and 22 subjects in color on 14 plates J B Lippincott Co., Philadelphia, Pa., publishers, 1949 Price \$12

**THE DIAGNOSIS OF PANCREATIC DISEASE** by Louis RAUMER, M D, *formerly Assistant Professor of Clinical Medicine, Columbia University, and Assistant Visiting Physician to the Presbyterian Hospital, New York* With a foreword by Allen O Whipple M D 74 pages J B Lippincott Co., Philadelphia, Pa. publishers, 1949 Price \$5

**THE PHYSICIAN'S BUSINESS**, Practical and Economic Aspects of Medicine by George D Wolf M D, *Assistant Clinical Professor, Otolaryngology, New York Medical College Fellow, New York Academy of Medicine Fellow, American Medical Association* Foreword by Harold Rypins A B, M D F A C P 3d edition 563 pages 96 Illustrations J B Lippincott Co., Philadelphia, Pa., publishers 1949 Price \$10

**FRACTURES**, by Paul B Magnuson M D F A C S, *Professor of Bone and Joint Surgery and Chairman of the Department, Northwestern University Medical School, Attending Surgeon, Passavant Memorial Hospital and Wesley Memorial Hospital, Chicago* and James K Stack A B M D F A C S, *Assistant Professor of Bone and Joint Surgery, Northwestern University Medical School, Attending Surgeon, Passavant Memorial Hospital and Cook County Hospital Chicago* 5th edition 537 pages 323 Illustrations J B Lippincott Co., Philadelphia, Pa., publishers, 1949 Price \$7

**INORGANIC CHEMISTRY IN PHARMACY**, by Lloyd M. Parks, Ph D, *Professor of Pharmaceutical Chemistry, University of Wisconsin*, Paul J Jannke, Ph D, *Associate Professor of Pharmaceutical Chemistry, University of Connecticut*, and Lord E Harris, Ph D, *Professor of Pharmacy, Ohio State University*, with a chapter on Isotopes by John E Christian Ph D, *Coordinator of Bio Nucleonic Research School of Pharmacy, Purdue University* 295 pages J B Lippincott Co Philadelphia, Pa., publishers 1949 Price \$6

# Tentative Program Session on Military Medicine and Surgery

## Section on Miscellaneous Topics American Medical Association Meetings

San Francisco, California

28-29 June 1950

1. Military Medicine and Surgery as a Specialty  
Presented by: Rear Adm. J. T. Boone (MC) USN  
Discussed by: Dr. Howard Risk  
Dr. I. S. Rardin
2. Medical Problems Encountered in A Bomb Explosions  
Presented by: Col. J. P. Cooney, MC USA  
Discussed by: Dr. Eugene Pendergrass  
Dr. Shields Warren
3. Treatment of High Intensity Thermal Burns  
Presented by: Dr. Everett I. Evans  
Discussed by: Dr. James Barrett Brown  
Maj. Edwin J. Pulaski MC, USA
4. The Treatment of Radiation Injuries  
Presented by: Dr. J. Garrett Allen  
Discussed by: Dr. Stafford Warren  
Lt. Comdr. E. P. Cronkite (MC) USN
5. Stress as a Factor in the Production of Neuropsychiatric Diseases  
Presented by: Dr. Donald W. Hastings  
Discussed by: Dr. F. R. Hanson  
Dr. R. B. Boyd
6. Civilian Defense Planning  
Presented by: Dr. Norvin C. Kiefer  
Discussed by: Dr. James C. Sargent  
Dr. Robert H. Flinn
7. Medical Problems in Chemical Warfare  
Presented by: Col. John R. Wood, MC USA  
Discussed by: Dr. A. McGhee Harvey  
Dr. George M. Lyon
8. Medical Research and Development in the Armed Forces  
Presented by: Maj. Gen. G. E. Armstrong, MC, USA  
Discussed by: Dr. M. C. Wintermiltz  
Dr. Lewis H. Weed
9. Medical Problems Encountered in Undersea Craft  
Presented by: Rear Adm. H. L. Ingh (MC) USN  
Discussed by: Capt. O. D. Yarbrough (MC) USN  
Capt. T. L. Whilmon (MC) USN
10. Communicable Diseases and Military Implications  
Presented by: Dr. Joseph E. Sarnel  
Discussed by: Dr. Norman Topping  
Dr. H. A. Reinmann
11. The Effects of Air Transportation on Clinical Conditions: Analysis of 1000  
Case Reports in 1949  
Presented by: Lt. Col. B. A. Strickland USAF (MC)  
Dr. J. A. Rafferty  
Discussed by: Brig. Gen. Wallace H. Graham, USAF (MC)  
Dr. W. Randolph Lovelace II
12. Military Medicine and its Relation to American Medicine  
Presented by: Dr. Richard L. Moling  
Discussed by: Maj. Gen. G. E. Armstrong, MC, USA  
Rear Adm. C. A. Swanson (MC) USN  
Maj. Gen. Henry G. Armstrong, USAF (MC)

Fifteen minutes will be allowed for the presentation of each subject.

*The Journal* is indexed in  
the following publications.

*Current List of Medical Literature*

(Army Medical Library) Weekly listings of  
journal contents by author, subject index  
monthly

*Quarterly Cumulative Index Medicus*

(American Medical Association) Author and  
subject.

*Index Catalogue of the Library of the Surgeon  
General's Office, U S Army*

(Army Medical Library) Now in Fourth Series  
Vol. X, Letter M (first half). Author and  
subject.

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

MEMORANDUM FOR: Personnel of the Medical Services of the United States  
Armed Forces

A program of Whole Blood and Blood Derivatives for the Armed Forces has recently been completed. In the main, this program guarantees the Armed Forces an adequate blood program in the event of war. In general, it establishes a war reserve for plasma, plasma substitutes, supplies and equipment and recommends the equipment and procedures of the Armed Forces be used as standard for the various civilian agencies that may be requested to assist the Armed Forces in the event of national emergency.

Medical personnel of the Armed Forces can take pride in this program. It is the result of joint planning by representatives of the medical services of the three military departments on a Task Group in this office. As a result, this program not only aids the Armed Forces in their plans for national defense, but it is one of the first steps toward an over-all national blood program.

Sincerely,

Richard L. Meiling, M.D.  
Director of Medical Services



# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published monthly by the Department of Defense*

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## Survival in the Cold

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THIS study was designed to obtain information about a situation likely to face the Army whenever it becomes urgently necessary to transport troops into cold regions. Under such conditions, men acclimatized to warm weather in Southern training camps may be sent by air into Northern areas, usually without being indoctrinated and acclimatized to the cold. This happened during World War II, when men from desert training camps went directly to Attu. A special case must be met when troops transported by air are forced down in the North, where they will face the necessity of making sudden provision for survival. The present study simulated a survival situation for 32 heat-acclimatized men transported by air from MacDill Air Force Base, Fla., to bivouac at Camp Shilo, Manitoba, Canada, in the dead of winter.

<sup>1</sup>U. S. Army Medical Nutrition Laboratory, Chicago, Ill.

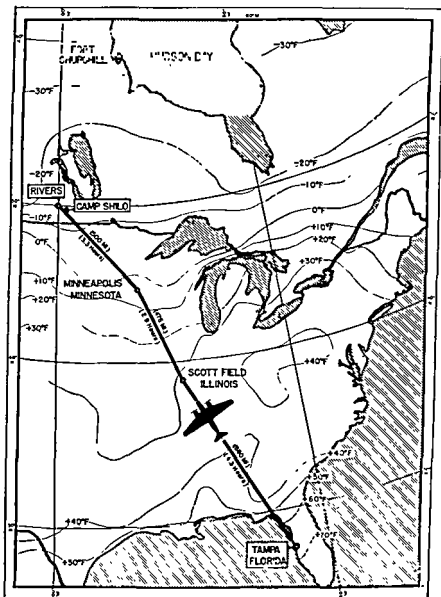


Figure 1.—Travel itinerary of test troops. The isotherms, derived from United States Weather Bureau data, are representative of the time of day at which the flight passed the given points.

Partial answers were sought to three general questions. First, what are some of the measurable metabolic changes in men during acute exposure to the cold, when the subjects are untrained and unacclimatized? Second, what are the dietary requirements for such men, performing only the minimal amount of physical work necessary to keep themselves comfortable in a cold bivouac area, and does the present experimental Air Force emergency ration meet these requirements? Specifically, under these conditions of acclimatization and activity, what are the requirements for water, calories, protein, inorganic salts, and vitamins? Third, can unifying explanations for the observations in these experiments be found in the literature on cold acclimatization, on heat acclimatization, on the "catabolic phase" after injury of any sort, on the adrenocorticotrophic hormone, or on the "adaptation syndrome" (1) (2) which is mediated by the pituitary-adrenal system when animals are subjected to severe stress? The reactions of the "adaptation syndrome" have been demonstrated in animals exposed to many types of stress, including cold, but as far as is known have not been studied in men exposed to the combined stresses of cold and inadequate rations.

In an attempt to answer these questions, a highly complicated experiment in which dietary, medical, biochemical, physiologic, and psychiatric observations were made on the subjects, first during a preliminary period in Florida, second during a simulated survival situation in the cold after the troops had been transported from Florida into Canada, and third during a period of recovery in heated barracks at Camp Shilo, Manitoba.

#### METHODS

Volunteer subjects from the 55th Reconnaissance Group at MacDill Air Force Base, Fla., were interviewed and examined, and 32 healthy young men were selected for the study. Few had ever experienced extremely cold weather, and many had never seen snow. After various observations had been made during a 2-week period, the men were issued pyramidal four-man Arctic tents with cloth floor and nylon liner, gasoline stoves (one- and two-burner), gasoline lanterns, mountain cook sets, and clothing (including U. S. Army Quartermaster winter issue of underwear, socks, woolen shirts, woolen trousers, sweaters, field caps with ear flaps, parkas, mittens with inner liners, windbreak trousers, and felt shoes) and were briefly acquainted with the use of this material.

On 20 January 1948, the troops and all their equipment were flown from MacDill Air Force Base, Fla., into Canada (fig. 1). During the 17-hour flight they were well protected against cold. During the two fuel stops they stayed in warm buildings. Two of the planes were poorly heated, but the troops were supplied with blankets and Arctic



## OUTDOOR WEATHER

FLORIDA

CANADA

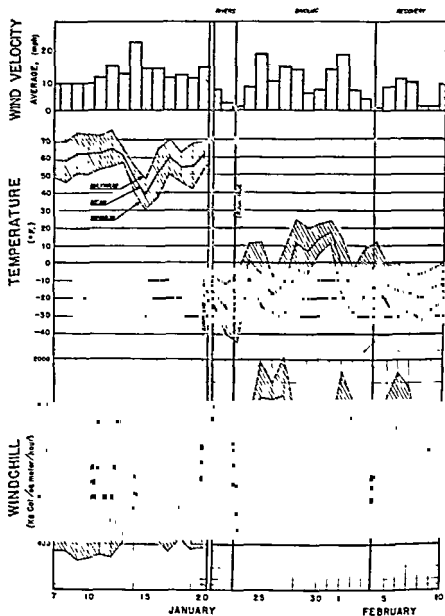


Figure 2.—Outdoor weather data in Florida and Canada in 1948. The windchill unit is one kilogram-calorie lost per square meter of exposed skin per hour based on the work of Siple (3).

# ACUTE EXPOSURE TO COLD-WATER BALANCE (AVERAGES FOR THIRTY SUBJECTS)

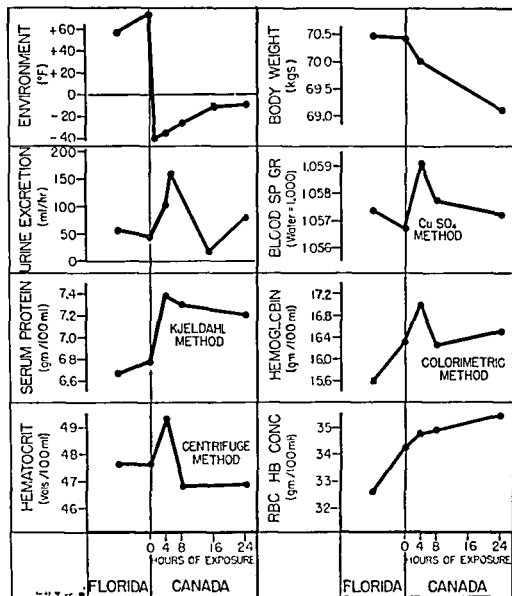


Figure 3.

clothing and there were only occasional mild complaints of cold. On arrival at Rivers Air Base, Manitoba, on 21 January, they were taken at once to well heated barracks kept at a mean temperature of 75° F. Except for minimal exposure to cold during transportation to and from heated mess halls, they were confined in these warm buildings for about 40 hours until the time for movement to their bivouac area near Camp Shilo, 45 miles away. It was assumed that any effects of the plane trip, such as chill and fatigue, were overcome by the restful stay in warm barracks. Subsequent studies of the pertinent data revealed no significant differences between the troops who had traveled in the heated plane and those in the unheated planes.

Early in the morning of 23 January, specimens of blood and urine were collected while the troops were still in the warm barracks. The troops were then transported without breakfast in open unheated canvas-covered trucks at a mean temperature of -35° F. to Camp Shilo, the trip of 45 miles taking 3 hours. At Camp Shilo, where an advance party of observers had made the necessary arrangements, further specimens of blood and urine were collected to detect alterations which had occurred during the 3-hour exposure to severe cold. At Camp Shilo, a specimen of blood was obtained and then the test subjects, still without breakfast, were issued rations and transported together with their tentage and duffel bags to the bivouac area, where they found ice for production of drinking water, and gasoline for cooking and heat. The bivouac region was chosen to assure isolation, desolation, and open exposure to the wind (fig. 2).

For the bivouac period, the 32 troops were segregated into 4 groups of 8 men. Each of the 4 groups was issued a different ration, as shown in table 1, and was restricted to a separate bivouac area, carefully isolated from civilization and from the other 3 bivouac areas, to prevent consumption of unauthorized foods and to prevent comparison of rations by the subjects of different groups. The 4 rations used in the bivouac period are described fully in the complete report.

TABLE 1—Issue of rations to test troops

Period and group	Ration	Issued (rations per man per day)	Actual consumption (calories per man per day)
Florida All groups	U. S. Army A ration	1	2,000
Bivouac			
I	Ration combat individual C-2	3½	1,120
II	Ration emergency Air Force (experimental)	1	1,940
III	Packet food individual assault (experimental)	1	1,850
IV	Ration small detachment 5-in 1	1½	4,850
Recovery			
I	Canadian Army ration scale No. 1	Unlimited	4,450
II	Canadian Army ration scale No. 1	Unlimited	4,800
III	Canadian Army ration scale No. 1	Unlimited	5,040
IV	Canadian Army ration scale No. 1	Unlimited	4,750

<sup>1</sup> Low calorie control group.

<sup>2</sup> High calorie (excess) control group.

<sup>3</sup> Recovery calorie consumption was measured for 3½ days only.

The subjects lived in their respective areas for the next 12 days, except for short periods of from 1 to 4 hours each, when they were brought by truck to cold vacant barracks at Camp Shilo (fig. 3). In this building, an inside temperature as near to 50° F. as possible was maintained, the subjects stripped to their underclothing and with individually assigned blankets and mattresses, awaited their turns for various experimental procedures and observations. To secure continuous detailed observations, one medical officer lived in the bivouac tents with each group for the 12-day period.

As a psychologic stratagem to insure the continuity and reliability of the last days' observations, the subjects and staff were led to believe that they would be "rescued" on the fourteenth day at the earliest. They were suddenly rescued on the evening of the twelfth day, when they were quickly transported to a warm building in Camp Shilo where temperatures between 70° and 80° F. were maintained. They stayed there for the next 90 hours except for meal times, at which times exposure to cold in transit to warm mess halls was minimal.

This segregation of the troops in warm barracks made possible observations on initial changes following a period of dietary restriction and exposure to the cold. The men were allowed to eat as much of the Canadian ration scale No. 1 (comparable to U. S. Army field ration A) as desired, and were allowed to rest as much as desired. Physical activity was minimal, because the test troops had only to try to keep themselves comfortable. The daily caloric expenditure was calculated from time activity charts. It ranged from 3,600 calories per man per day in the high-calorie control group to 2,800 calories per man per day in the low-calorie control group, spontaneous voluntary activity in the bivouac area accounting for the differences.

The following observations were made once or more, and all data were subjected to statistical analysis:

(a) *Anthropometric observations*.—Body weight, height, surface area, waist circumference, and chest expansion.

(b) *Dietary history*.—Questionnaire on food preferences, quantitative consumption measurements, and quantitative chemical analysis of all food items used in the bivouac period.

(c) *Medical history*.—Incidence and intensity of symptoms.

(d) *Medical examination*.—Physical examination for signs of nutritional abnormalities; roentgenogram and electrocardiogram.

(e) *Psychiatric observations*.—Minnesota multiphasic personality inventory, personal interviews, self-appraisal questionnaire, diaries kept by test subjects, and observation by medical, military, and test personnel.

(f) *Functional observations*.—Physical fitness tests, gastrointestinal activity, skin and oral temperatures, renal-adrenocortical

# ACUTE EXPOSURE TO COLD—HEMATOLOGY (AVERAGES FOR THIRTY SUBJECTS)

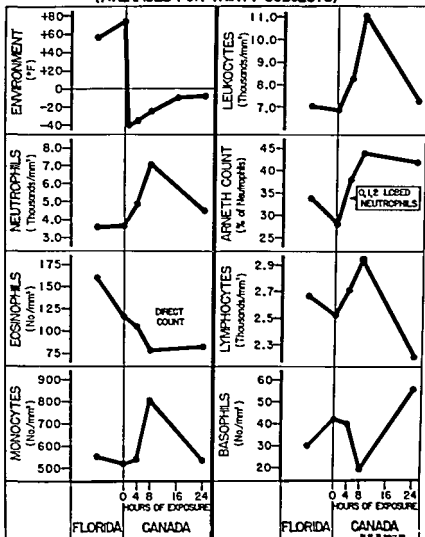


Figure 4.

# ACUTE EXPOSURE TO COLD—METABOLISM

(AVERAGES FOR THIRTY SUBJECTS)

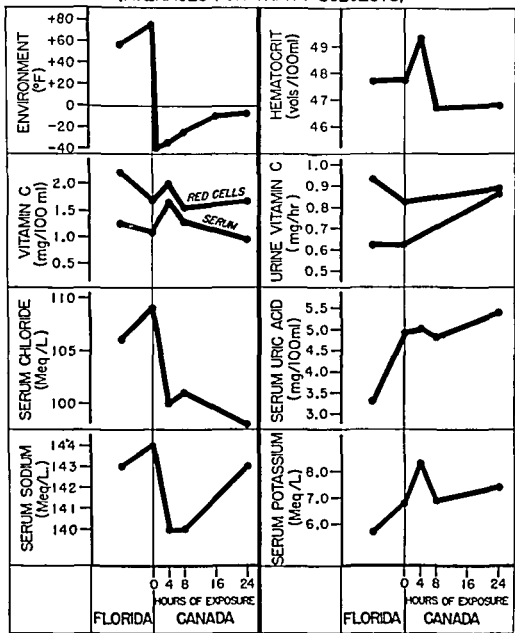


Figure 5.

function tests by the water restriction-diuresis test, cardiovascular response to the cold pressor test, plasma and blood volumes, and qualitative examination of urine for acidity, acetone, sugar, albumin, and specific gravity.

(g) *Biochemical measurements*—*Whole blood*: ascorbic acid; *serum*: chloride, inorganic phosphorus, sodium, potassium, ascorbic acid, uric acid, protein, *urine*: ascorbic acid, chloride, sodium, potassium, nitrogen, phosphorus, calcium, uric acid, creatinine, creatine; *fecal*: nitrogen, calcium, and phosphorus; and *ration*: ascorbic acid, nitrogen, calcium, phosphorus, sodium, potassium, and chloride.

(h) *Balance studies*—All urine and feces were collected during the bivouac period. From analytical data on these, together with analytical data on the foods and fluids consumed, balances were computed for water, calories, nitrogen, sodium, potassium, phosphorus, calcium, and chloride.

(i) *Hematologic measurements*—Red blood cell count, white blood cell count, differential count, hemoglobin, hematocrit, direct count of eosinophils, and Arneeth's count.

(j) *Endocrines*.—Urinary excretion of 17-ketosteroids, gonadotropins, corticosteroids, androgens, and serum protein-bound iodine.

(k) *Acceptability, utility, and stability of rations*—Direct observation by quartermaster and medical observers, qualitative data from questionnaires filled out by subjects, quantitative data from measurement of food consumption, and modification of items during storage, handling, freezing, and thawing.

#### REACTIONS TO COLD INDEPENDENT OF DIET

*Acute exposure (first 24 hours)*.—The statistically significant responses to acute exposure to the cold (i. e., differences between Florida and the first day of bivouac at a mean temperature of  $-26^{\circ}$  F.) included (a) diuresis, with negative water balance, (b) hemoconcentration, with increases in concentration of serum protein, high hemoglobin, and high hematocrit readings; (c) reduction of eosinophils and lymphopenia (d) neutrophil leukocytosis, with increase in the percentage of immature forms; (e) hyperuricemia, hyperphosphatemia, and hyperpotassemia; (f) hyponatremia and hypochloremia; (g) transient retention of sodium and chloride, with transient increase of potassium in urine; (h) diminution of ascorbic acid in the blood, with an increase in the urine; and (i) transient hypothermia.

*Short term effects (first 12 days)*.—The significant subacute effects of cold independent of diet (i. e., the difference between Florida and the latter part of the 12-day bivouac period) included (a) change in kidney and adrenocortical function, a test dose of water being excreted rapidly and at a very low specific gravity; (b) eosinopenia and lymphopenia; (c) prolonged hyperuricemia and hyperphospha-

temia; and (d) bradycardia and decreased pulse pressure (figs. 4 and 5).

*Recovery after 12-day exposure.*—The significant changes in recovery independent of diet (i. e., differences between bivouac period and recovery period in warm barracks) included (a) large increase in body weight; (b) large positive water balance; (c) rise in eosinophil and lymphocyte count; (d) shift of neutrophils toward more mature forms; (e) diminution in serum uric acid and inorganic phosphate concentration; and (f) reversion of cardiovascular and of kidney and adrenocortical function toward Florida values.

*Conclusions regarding the immediate reactions to exposure to intense cold for 24 hours.*—On the basis of balance studies, there was no convincing evidence of a "catabolic phase" followed by an "anabolic phase," such as is seen after injury, although on the first day all groups excreted more nitrogen than on any other day of the bivouac period.

Many similarities were found between the present results and the effects of injecting ACTH (1). These similarities included hematologic changes (decrease of eosinophils, lymphopenia, neutrophil leukocytosis) and biochemical changes (increased serum uric acid, increased serum phosphate, retention of sodium and chloride, increase in the urinary uric acid/creatinine ratio), and the reversal of these changes when the cold stimulus was removed.

There were also many similarities between the present findings and those occurring in the general adaptation syndrome resulting from stress. During the first 24 hours there were changes similar to those occurring in the shock and countershock phases of the alarm reaction, i. e., hypothermia, diuresis and hemoconcentration, neutrophil leukocytosis, eosinopenia, lymphopenia, hyperuricemia, hyperphosphatemia, hyperpotassemia, hyponatremia, and hypochloremia. Most of these changes had reverted to preexposure values in 24 hours, except for the hematologic changes. The phase of resistance might be considered to be present in the last 10 days of exposure and the withdrawal of the cold stimulus, with many rebound phenomena, might be considered to represent the removal of the stress during the 7-day recovery period.

In the high-calorie control group, urinary excretion of 17-ketosteroids and androgen increased during the bivouac periods. In the three low calorie groups there were decreases. In all groups there was a diminution in the concentration of serum protein-bound iodine, and no consistent changes in urinary excretion of corticosteroids and androgens. These quantitative endocrine studies support the view that in well-fed men the pituitary-adrenocortical system is sharply stimulated during abrupt exposure to cold. In the present groups of subjects on low-calorie diets, some of the changes were either absent or in some way masked.



## REACTIONS OF THE TEST SUBJECTS AS RELATED TO DIET

The significant changes related to diet in the bivouac period (i. e., changes between the beginning and the end of the bivouac period) included (a) change in body weight in proportion to caloric balance; (b) nitrogen, phosphorus, calcium, sodium, potassium, and chloride balances in direct proportion to the intake of these substances; (c) voluntary fluid consumption related to the specific ration, with those

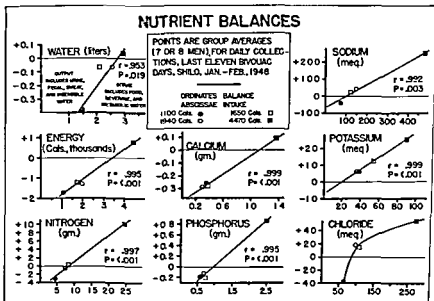


Figure 6—Summary of nutrient balances.  $r$ =correlation coefficient between calculated line and observed data.  $P \times 100$ =chances in 100 that this correlation could have occurred by chance alone.

on the experimental Air Force emergency ration drinking almost a quart of water daily more than those on any other ration; (d) diminution in number of bowel movements directly proportional to caloric content of the ration; (e) increase in depressive symptoms in the three low-calorie groups compared to the high-calorie group as judged by the Minnesota multiphasic personality inventory; and (f) changes in the concentration of ascorbic acid in the blood and the excretion of ascorbic acid, related to the dietary intake of ascorbic acid, all being low in the group on the experimental Air Force emergency ration.

The following general conclusions are drawn concerning the rations, as they were used in a survival situation in the cold for 12 days:

(a) The only ration that sustained health, fitness, good psychologic attitude, and nutritional balance completely for 12 days was the 4,850 calorie 5-in-1 ration.

(b) The experimental Air Force emergency ration (1,940 calories) was in no way nutritionally superior to the 1,650-calorie experimental assault packet, and was greatly inferior in that it induced great thirst as proved by the consumption of fluids and was on the whole unpalatable. Its field utility was good.

(c) The low-calorie control ration (one-third of a C-2 ration) was equal to the other two low-calorie rations in every way except that negative nutrient balance was greater with it than with the other two. It was more palatable than the experimental Air Force emergency ration.

(d) When observed nutrient balances were plotted against actual nutrient intake, it was possible to calculate that nutrient intake at which exact balance could be maintained under the conditions of the present test (fig. 6). Such a calculation showed that for men with adequate clothing, fuel, and tentage, and doing no physical work other than that necessary to keep themselves comfortable, a balance could be obtained with palatable rations supplying, for an average 70-kilogram man, the nutrients shown in table 2.

TABLE 2.—Nutrient intake necessary to maintain balance under conditions of present test

Nutrient per man per day		Present test	Recommended daily allowance <sup>1</sup>
Calories		3,400	2,400-3,000
Water, including beverages, water in food items, and metabolic water	liters	2.8	2.5
Protein, mostly animal	grams	53	70
Carbohydrate	do	460	
Fat	do	150	
Potassium chloride	do	1.5	
Sodium chloride	do	6.0	5-10
Phosphorus	do	1.0	
Calcium	do	1.2	1.0
Vitamins			
Thiamine	milligrams	(2)	1.5
Riboflavin	do	(2)	1.8
Niacin	do	(2)	15
Ascorbic acid	do	30-40	75

<sup>1</sup> National Research Council

<sup>2</sup> Temperate climate, moderate activity

<sup>3</sup> Incomplete data

Conclusions from the present study should not be applied to any troops regularly required to perform more than moderate physical work. The evils of calorie deficiency among working troops should be so well known by now as to make this warning unnecessary, but experience in World War II showed that there is constant danger of inadequate calorie issue.

#### DISCUSSION

The implications of the present findings for further research on cold adaptation in man are clear. One phase of such continued study should be an assessment of the possibility of preacclimatizing men by treatment with ACTH. The known conferment of artificial ac-

climatization to heat by treatment with desoxycorticosterone acetate emphasizes the desirability of such studies in the cold. Another phase should cover further assessment of possible dietary and endocrinologic interrelations during adaptation to cold.

The implications of the present experiment for further ration development are also clear. There is good information on what American troops want and should have to eat, and in the present survival experiment, on what is required to keep inactive men in nutrient balance. Three lines of further research are indicated to answer the questions: (a) For troops in a survival situation, who have to protect themselves against the often hostile environment, extricate themselves, and guard against enemies, what are the safe limits of negative nutrient balance, both in duration and in degree of imbalance? (b) What importance should be attached to vitamins in a survival ration or, specifically, what is the vitamin C requirement in the cold? (c) What are the relative importances of fuel, water, and food in survival rations?

#### SUMMARY

During the course of a field test on the nutritional requirements of rations for survival in the cold, a comprehensive study was made on 32 volunteers flown directly from Florida to Canada in the dead of winter.

Complete metabolic balance studies were made for 12 days, during which time 4 groups of 8 men were segregated in separate survival areas and ate 1 of 4 different rations. Clear answers were obtained on the balance requirements for calories, water, protein, carbohydrate, fat, sodium, potassium, chloride, calcium, and phosphorus.

Frequent biochemical, physiologic and hematologic observations suggested that during the first 2 days of abrupt exposure to cold, unacclimatized soldiers exhibit a general adaptation syndrome, with stimulation of the pituitary-adrenocortical system.

#### REFERENCES

1. SELYE, H. General adaptation syndrome and diseases of adaptation. *J Clin Endocrinol* 6: 117-239, Feb 1946.
2. FORSHAM, P. H.; THORN, G. W.; PRUNTY, F. T. G.; and HILLI, A. G. Clinical studies with pituitary adrenocorticotropin. *J Clin Endocrinol* 8: 15-64, Jan 1948.
3. SIPLE, P. A.: Dry atmospheric cooling in subfreezing temperature. *Proc. Am Philos. Soc.* 89: 177-200, Apr 30, 1945.

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# Fibrocystic Disease of Pancreas

## Review of the Literature and Report of a Case

CHARLES J. MOLNAR, JR., *Lieutenant, junior grade (MC) U. S. N.*<sup>1</sup>

IN 1888, Gee (1) of St. Bartholomew Hospital, London, described a symptom complex in children characterized clinically by early onset (1 to 5 years), irritability, loss of appetite, nausea, intolerance to fats and carbohydrates, large, frequent, fatty, foul-smelling stools, and varying degrees of malnutrition together with a protruding abdomen, stunting of growth, pallor, and weakness; this he called celiac disease.

However, during the past 11 years, the studies of Andersen and other investigators have shown that what has been known as celiac disease is composed of several distinct entities, each with its own clinical characteristics and laboratory findings. Of these, one of the most interesting is fibrocystic disease of the pancreas. This disorder, while presenting many manifestations in common with the celiac syndrome has certain distinguishing features which make its diagnosis more or less absolute.

Cystic fibrosis of the pancreas is a congenital and familial disease characterized clinically by an early onset, excellent appetite associated with poor weight gain, large, foul, fatty stools, and frequent respiratory infections with the development of chronic bronchitis and often bronchopneumonia and/or bronchiectasis terminally. The characteristic laboratory finding is the absence or considerable diminution of the secretion of pancreatic juice.

Because of the varied clinical findings and the disputed etiologic factors, classification of this disease is difficult. For practical purposes Farber (2) has proposed dividing the patients having this disease into three clinical groups: (a) those who died in the first few weeks of life, usually from meconium ileus; (b) those who died, usually in the first year of life, having had nutritional disturbances often associated with intercurrent respiratory disease; and (c) those who died of respiratory disease and who had preceliac or celiac symptoms. According to

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Farber (2), Andersen (3) and Zuelzer and Newton (4), the most common of these three groups is the second. The smallest number are in the third group, for death usually occurs before the celiac symptoms are clinically manifested. Zuelzer and Newton (4), in a study of 36 cases, reported that 14 percent of their patients died with meconium ileus in the newborn period; 67 percent of these patients had symptoms of initial upper respiratory infection; and 80 percent had respiratory symptoms before the age of 3 months.

The incidence of this disease is probably much greater than suspected. In 1938 Blackfan and May (5) reported that in 4 percent of 800 autopsies, pancreatic changes of some degree consistent with the diagnosis of cystic fibrosis of the pancreas was evident. Andersen (3) reported an incidence of 3.3 percent in her necropsy records during the same year.

Philipsborn, Lawrence, and Lewis (6) concluded from their study that there was no appreciable difference in the distribution between the sexes. However, Andersen (3) in her 1938 report of 49 cases, noted an incidence of 67 percent in female children.

Cystic fibrosis of the pancreas is predominantly a disease of infancy. The onset is usually during the first 6 months of life. In Philipsborn's (6) series of 26 patients, the oldest age at onset was 1 year. The remaining 25 were 5 months and under and the oldest was 4 years at death. Andersen (3) reported 1 child living to the age of 14½ years.

According to Zuelzer and Newton (4) cystic fibrosis of the pancreas is rare in Negroes.

From the review of 114 cases in which information as to siblings was given, Andersen (8) in 1946 drew the conclusion that "cystic fibrosis of the pancreas occurs among siblings, twins, and more distant relatives with a distribution which is compatible with the hypothesis that it is carried as a relatively infrequent hereditary trait."

Zuelzer and Newton (4) report a familial incidence of 7 in 21 families with histories that could be evaluated.

The etiologic factors and pathogenesis of fibrocystic disease of the pancreas is not clear. Norris and Tyson (7) have studied this disease anatomically, and concluded that the pathologic changes in the pancreas are congenital in that there is a characteristic distortion, cystic dilatation, and segmentation of the ducts. Simultaneously, replacement fibrosis takes place and does not interfere with the normal gross development of the pancreas. They compare the pancreatic lesion with polycystic changes in the kidney and liver.

Andersen and Hodges (8), on the other hand, believe that the lesion in the pancreas is not a malformation in the true sense of the word, but appears in the latter part of pregnancy. They believe that the pathologic change in the pancreas results from an abnormality of the

acinar secretion, and a comparable disturbance is found in the liver, gallbladder, intestines, and possibly in other glands. Baggenstoss (9) believes that the initiating congenital defect is in the inability of the patients to produce secretin in the duodenum which results in inspissation of pancreatic secretion. Farber (2) and Zuelzer and Newton (4) support the concept that this disease is a systemic affection characterized by the production of an abnormal secretion in a variety of glandular organs. It is their belief that the respiratory disturbance is an essential feature of the disease and is of the same pathogenesis. Andersen and Hodges (8) (10) however, attribute the respiratory changes to be secondary to a congenital defect. The lack of pancreatic secretion and consequent deficient digestion leads to a deficiency of a substance essential for the normal functioning of the bronchi. The fact that vitamin A is poorly absorbed by these patients, and that deficiency of vitamin A may lead to a change from ciliated to squamous epithelium in the bronchial mucosa, leads to the belief that vitamin A may be the essential substance. This concept is the basis for their treatment, which apparently gives good results (10).

The histopathology of the pancreas is uniformly described by most authors (2) (6) (11) (12) (14). Farber (2) describes the pancreas as follows: "The lesion in the pancreas seen most frequently is characterized by dilatation of ducts, inspissation of secretion, atrophy of acinar structures and replacement of connective tissue leading to marked fibrosis of the organ." Atresia or stenosis of the pancreatic ducts is not a constant finding. In the majority of cases, the obstruction appears in the acini. The islets of Langerhans are not involved, although the acinar pathologic change is progressive.

Significant lung pathologic changes usually occur during the first 6 months of life. Fundamentally the process in the lung is one of respiratory obstruction caused by tenacious mucus and secondary infection by *Staphylococcus aureus* (2) (6). The lungs in the majority of the patients contain bronchopneumonic areas and single or multiple abscesses. Emphysema, atelectasis, and bronchiectasis are common.

The liver may be enlarged (2) and show fatty changes (2) (6).

Distention of the acini and ducts of the salivary glands, with inspissated secretion as well as those of the mucous glands of the esophagus, duodenum, jejunum, and gallbladder are frequently noted.

Congenital obstruction of the gastrointestinal, genito-urinary, and biliary systems are found in association with fibrocystic disease of the pancreas.

Meconium ileus is the characteristic finding in the newborn. May and Lowe (12) believe that all infants suffering from meconium ileus or who exhibit unusual difficulty in passing meconium should be sus-

pected of fibrocystic disease of the pancreas. Other early findings are: a failure to gain weight despite good consumption of food; large, foul, fatty, frothy stools (common though not diagnostic); vomiting; diarrhea; and recurrent respiratory infections associated with a prominent cough that can be confused with whooping cough. The respiratory symptoms may overshadow the gastrointestinal picture. Should these patients survive the first 6 months, the celiac picture usually appears; i. e., retardation of growth, abdominal distention, emaciation, more frequent stools, and behavior disturbances. The respiratory infection becomes progressively more frequent and more severe.

Of the laboratory aids to diagnosis, the most important is the enzymatic analysis of the duodenal juice. The pancreatic enzymes, lipase, amylase, and trypsin are greatly reduced or absent. Andersen and Early (14) have described a technique for obtaining duodenal juice for analysis and stressed the importance of tryptic activity in the diagnosis. Secretin, according to Philip-born (6), may be given intravenously to stimulate the production of pancreatic juices. In fibrocystic disease, the enzymes, particularly trypsin, are decidedly reduced before and after stimulation. Anfanger and Heavensack (13) describe an amino acid tolerance test to aid in the diagnosis of this disease. The test depends upon the failure of digestion of protein as evidenced by the failure of the blood amino acid level to rise after the ingestion of gelatin. Andersen and Early (14) describe a laboratory procedure for determining trypsin activity.

Because of the poor fat absorption, the stools contain large amounts of fats, this may contribute to the low blood cholesterol.

There is a great loss of nitrogen in the stool, far in excess of the urinary excretion of nitrogen, and this is responsible in part for the patient's poor nutritional state (15).

Vitamin A is poorly absorbed, and hence, low blood vitamin A curves may be of diagnostic value if done serially (6).

Glucose tolerance curves are usually flat, although they may show an initial sharp rise and a rapid fall as in hunger curves (15).

Attwood and Sargent (18) describe the lung findings as determined by roentgenographic study as follows:

There is an increase in the density of hilar shadows, with loss of definition and prolongation outward into a surrounding mottling that gradually diminishes toward the periphery of the lung. The changes are bilateral and are symmetrically distributed about the roots of the lungs and the adjacent parenchyma. The changes in the upper and lower lung fields are equally marked. Later in the disease, patchy areas of peribronchial infiltration and bronchiectasis are noted. The final stage is that of pneumonic infiltration, bronchiectasis, and bronchiectatic abscesses with varying degrees of atelectasis and obstructive emphysema.

Farber (15) directs therapy against the following four conditions which are directly or indirectly caused by pancreatic insufficiency: (a) absent or greatly reduced pancreatic enzyme activity, particularly trypsin and lipase; (b) malabsorption of vitamin A; (c) loss of nitrogen in the stools; and (d) upper respiratory obstruction and infection leading to bronchiectasis and bronchopneumonia.

Pancreatic substitution therapy is indicated for the pancreatic insufficiency. Farber (15) suggests pancreatic granules, 1 to 5 gm. daily in divided doses, sprinkled on the patient's food. May and Lowe (12) believe that the usefulness of pancreatic granules is questionable because the enzyme potency is low or uncertain and relatively little improvement is effected in absorption, and that they frequently decrease the appetite. Andersen, however, recommends the use of pancreatin, as does Philipsborn (6).

Farber (15) suggests 50,000 international units of vitamin A daily in divided doses supplemented by other vitamins. Prostigmine bromide may be given in doses of 3.75 to 7.50 mg. three times daily.

Farber (15), Andersen (10), and di Sant'agnese and Andersen (16), recommend a high caloric diet and allow 30 to 50 percent greater caloric intake than that for calculated age, because of food loss in the stools. High protein, moderately low fat, and low starch diet is recommended. May and Lowe (12) (17) advise a well-balanced diet, adequate to satisfy the appetite. They believe there is little evidence supporting the nutritional theory in the cause of respiratory complications as advanced by Andersen, and that special diets are not warranted.

All authors agree that treatment with antibiotics is indicated for the concurrent respiratory infections. Di Sant'agnese and Andersen (16) suggest the use of sulfonamides prophylactically and in early respiratory infection but they are ineffective after the stage of suppurative bronchitis has begun. Penicillin may be effective in treatment of the respiratory tract after the appearance of respiratory distress and cyanosis, provided the organisms are sensitive. May and Lowe (12) (17) and di Sant'agnese and Andersen (16) believe that the most effective way of administering penicillin is by aerosol and simultaneous intramuscular injection of the drug.

Late onset of the respiratory symptoms, good general development, and previous dietary regimen are to the patient's advantage.

#### CASE REPORT

M. A. L., a 5-year-old white girl, was admitted to the United States Naval Hospital, Philadelphia, Pa. She was cyanotic and had respiratory distress.

*Precious history*—The patient was first seen in this clinic at the age of 2½ years because of frequent upper respiratory infections, large, foul-smelling, oily, mushy stools, and weight loss (fig 1).



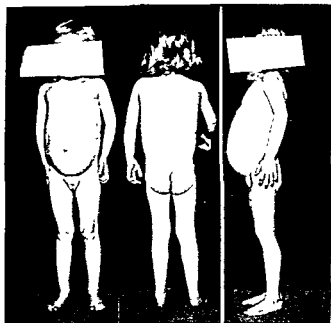


Figure 1—M. A. L. at age 2 years.

At birth she weighed 6 pounds 8 ounces, at 6 months, 11 pounds, at 1 year, 15 pounds, at 1½ years, 22 pounds, and at 2½ years, 20 pounds. She was in good health until the age of 2 years, when a hacking and nonproductive cough began. Two months later her appetite began to fail and she showed a preference for protein food. She began to lose weight, and large, yellow, mushy stools, which previously had been brown and formed, were noted.

Physical examination at age 2½ years showed a chronically ill child. Fine crepitant rales were heard anteriorly and posteriorly in both lungs, there was no change on percussion. The heart was normal, abdomen protuberant; the vulvar fat was atrophied, liver and spleen were palpable just below the costal margin, and the buttocks and extremities showed evidence of wasting.

Tuberculin test (purified protein derivative No. 2) was negative at this time.

Laboratory examination of the stools revealed moderate amounts of neutral fat droplets, flakes, and fatty acids. Analysis of duodenal juice revealed: lipase, 1.6 cc (lowest normal figure is 10 cc), no evidence of the presence of any trypsin; and amylase, 0.1 mg (normal value for a child over 9 months is 20 cc. or more).

Chest roentgenograms showed accentuation of the bronchovascular markings bilaterally, and linear areas of increased density with diffuse nodular beading which extended out into the peripheral zones of the lung fields were radiating out from the hilar regions (fig. 2). Roentgenograms of the long bones, heart, and abdomen were essentially negative.

With a history of chronic cough, frequent upper respiratory infection, loss of weight, large, foul, yellow, mushy stools, moderate amount of neutral fat droplets in the stool, absence of trypsin in duodenal juice, and pathologic lung changes as revealed by physical examination and roentgenograms, it was believed that the diagnosis of fibrocystic disease of the pancreas was established.

A high-protein, high-carbohydrate, and low-fat diet, vitamin D, and additional vitamin A, and pancreatin, 1 teaspoonful three times daily were prescribed.

She did well on this regimen. At the age of 3 years her appetite had improved, her coughing reduced, stools were brown and formed, and she had gained 3 pounds. However, her chest roentgenograms still showed peribronchial infiltration extending from the hilar trunks to the periphery.

Episodes of upper respiratory infections with fever continued; these responded to treatment until the present admission at the age of 5 years.

*Present history.*—Physical examination revealed an underweight, apprehensive, white child in acute distress. She was cyanotic, respirations were shallow and rapid, and her skin was pale and moist. Her temperature was 99.6° F, pulse rate, 142; respirations, 48. Eyes, ears, nose, throat, and heart were essentially normal. Loud moist râles were heard over the entire chest with respiratory wheezes. The abdomen was protuberant and there was early clubbing of fingers and 1+ pitting edema over the feet.

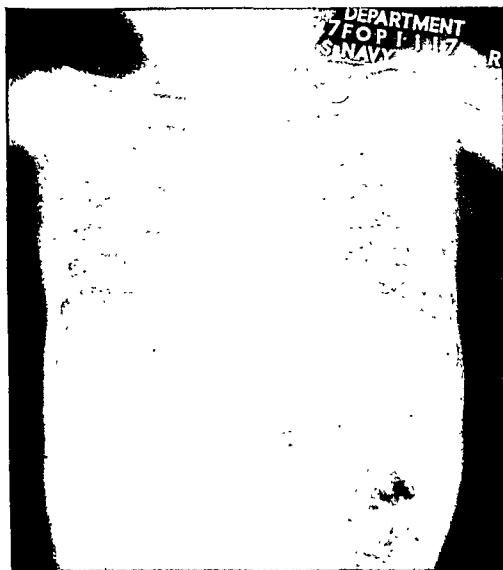


Figure 2.—Roentgenogram of the chest at age 2½ years.

Laboratory examination on admission revealed a moderate hypochromic microcytic anemia, normal white blood cell count and differential, and a trace of albumin and 1+ sugar in the urine.

She continued downhill in spite of vigorous therapy with intravenous fluids, whole blood, and penicillin. Death occurred 40 hours after admission, apparently from respiratory obstruction.

### Autopsy

Autopsy showed the following:

#### Gross examination

The body was that of a white female child who appeared considerably younger than the stated age of 5 years. Height 38 inches, weight 30½ pounds. There was periorbital edema, abdominal distention, moderate atrophy of the gluteal muscle, and a yellow purulent material in both naves.

*Peritoneal cavity*—There was 500 cc. of clear yellow fluid and the colon was distended throughout.

*Pleural cavity*—A few thin fibrinous adhesions were between the parietal and visceral pleura of both lungs.

*Mediastinum*—Mediastinal nodes were enlarged but showed no evidence of infiltration or necrosis. The trachea appeared to be completely filled with a yellow mucopurulent material.

*Lungs*—The external surface had a pale pink appearance and numerous deep purple areas were noted below the pleural surface. Upon palpation and sectioning these were found to be areas of consolidation. The ramification of the bronchial tree appeared to be almost filled with a thick tenacious mucopurulent yellow material. There was also a suggestion of segmental dilatation of the smaller bronchi.



Figure 3—Microscopic view of pancreas.

*Liver and biliary passages*—Upon sectioning, the liver parenchyma had a pale brown appearance with a suggestion of whitish mottling which gave a nutmeg effect. The remainder appeared normal.

*Pancreas*—Palpation suggested a slight increase in fibrous consistency. On sectioning small fibrous areas were noted; no cystic areas were encountered; ducts appeared normal.

#### Histologic examination

*Respiratory*—Practically all of the alveoli showed microscopic consolidation either with closely packed polymorphonuclear leukocytes or masses of red cells which had the appearance of recent hemorrhage. In addition to these pneumonic features, the bronchioles were completely filled with solid plugs of polymorphonuclear leukocytes. In many areas the bronchiolar mucosa was absent. The surrounding adventitial tissue was greatly thickened with

fibrous tissue and a heavy infiltration of acute and chronic inflammatory cells. Some bronchioles appeared to be considerably dilated with thickened redundant mucosa. An abscess composed of polymorphonuclear leukocytes was encountered in one section.

*Liver.*—There was an extensive degree of fatty degeneration with only a rare intact parenchymal cell. The central area of the lobules was congested with red blood cells.

*Pancreas.*—In numerous sections, no pancreatic glandular tissue could be found. The glandular tissue was replaced by dense fibrous and collagenic connective tissue in which were embedded islands of duct structures lined with a columnar epithelium. Some of the larger ducts were dilated and contained an eosinophilic acellular material. Adjacent to these large structures, numerous small clusters of ducts were embedded in the fibrous tissue. Occasional clusters of lymphocytes were seen and compressed islets of Langerhans were noted (fig 3).

Pathologic diagnosis confirmed the clinical diagnosis of fibrocystic disease of the pancreas with associated bronchopneumonia, bronchiectasis, and pulmonary abscesses secondary to bronchiectasis.

#### REFERENCES

1. GEE, S. J.: St Bartholomew Hospital Report 34: 17-22, 1888.
2. FARMER, S.: Pancreatic insufficiency and celiac syndrome. *New England J Med* 229: 653-657, Oct. 21, 1943.
3. ANDERSEN, D. H.: Cystic fibrosis of pancreas and its relation to celiac disease. *J Pediat*, 56: 344-399, Aug. 1938.
4. ZIEGLER, W. W., and NEWTON, W. A.: Pathogenesis of fibrocystic disease of pancreas. *J. Pediat* 4: 53-69, July 1949.
5. BLACKFAN, K. D., and MAY, C. D.: Impairment of secretion, dilatation of ducts and atrophy, atrophy and fibrosis of pancreas in infants. *J. Pediat*, 13: 627, 1938.
6. PHILIPSBORN, H. E., JR.; LAWRENCE, G.; and LEWIS, K. C.: Diagnosis of fibrocystic disease of pancreas based upon 26 proved cases. *J. Pediat* 25: 284-298, Oct. 1944.
7. NORRIS, R. F., and TYSON, R. M.: Pathogenesis of polycystic pancreas. *Am. J. Path* 23: 485-499, 1947.
8. ANDERSEN, D. H., and HODGINS, R.: Celiac syndrome: genetics of cystic fibrosis of pancreas with consideration of etiology. *Am. J. Dis. Child*, 72: 62-80, July 1946.
9. BAGGENTOSS, A. H.: Fibrocystic disease of pancreas with no secretin. *Gastroenterology* 11: 208, Aug. 1948.
10. ANDERSEN, D. H.: Therapy and prognosis of fibrocystic disease of pancreas. *J. Pediat*, 3: 406-422, Apr. 1949.
11. ANDERSEN, D. H.: Pancreatic enzymes in duodenal juice in celiac syndrome. *Am. J. Dis. Child*, 63: 643, Apr. 1942.
12. MAY, C. D., and LOWE, C. U.: Fibrosis of pancreas in infants and children. *J. Pediat* 34: 663-687, June 1949.
13. ANSCHUTZ, H., and HEAVENSICK, R. J.: Amino acid tolerance tests in children. *Am. J. Dis. Child* 77: Apr. 1949.
14. ANDERSEN, D. H., and EARLY, M. V.: Method of assaying trypsin suitable for routine use in diagnosis of congenital pancreatic deficiency. *Am. J. Dis. Child* 63: 891-893, May 1942.
15. FARMER, S.: Pancreatic insufficiency and celiac syndrome. *New England J. Med.* 229: 683-687, Oct. 28, 1943.

- 16 DI SANT'AGNESE, P. E. A., and ANDERSEN, D. H. Celiac syndrome; chemotherapy in infections of respiratory tract associated with cystic fibrosis of pancreas; observations with penicillin and drugs of sulfonamide group, with special reference to penicillin aerosol. *Am. J. Dis. Child* 72: 17-61, July 1946
- 17 MAY, C. D., and LOWE, C. U. Treatment of fibrosis of pancreas in infants and children. *J. Pediatr* 1: 159 Feb 1948
- 18 ATTWOOD, C. J., and SARGENT, W. H. Cystic fibrosis of pancreas with observations on roentgen appearance of associated pulmonary lesions. *Radiology* 39: 417-423, Oct. 1942



THE SURGICAL MANAGEMENT OF PULMONARY COCCIDIOIDOMYCOSIS IN FOCALIZED LESIONS, by Sam J. Greer, M. D.; James H. Forsee, *Colonel, MC, U. S. A.*; and Hugh W. Mahon, *Colonel, MC, U. S. A.* *Journal of Thoracic Surgery* 18: 591-604, Oct. 1949.

Coccidioidomycosis is endemic in Texas, New Mexico, Arizona and California. Patients who were trained in these regions and who contracted the disease while in the Armed Forces are now being discovered throughout the country. The disease exists in a primary respiratory form that is usually self limited and in a disseminated form that has a case fatality rate of about 50 percent. The authors report 13 patients having coccidioid infections with focalized pulmonary lesions upon whom operations were performed. Nine had persistent cavitation for which lobectomy was performed, and four had rounded granulomatous lesions that were removed by wedge resection of the lung. The lesion was discovered on a routine roentgenogram of the chest in each case, although two of the patients gave a history of episodes of pleuritic pain on the side of the lesion and had had mild chronic productive coughs. The other two patients had been asymptomatic. The diagnosis was not established preoperatively in any of the four patients, although coccidioidomycosis was suspected in three. The nine patients with persistent cavitation were all symptomatic. They complained of a chronic cough that was productive except in one instance, but in no case was the cough severe, and none of the patients produced more than 1 cupful of sputum daily.

The diagnosis of chronic granulomatous lesions of coccidioidomycosis can seldom be made with certainty, and it is a sound policy to remove these tumors if only to establish a diagnosis and rule out the possibility of a more dangerous lesion. Even if the diagnosis is certain, operation removes the threat of cavitation or dissemination while the lesion is focalized. The problem of dealing with persistent cavitation is a difficult one. The cavities are usually near the periphery of the lung and may rupture, causing bronchopleural fistula, coccidioidal empyema, and nonexpandable lung. The authors believe that pulmonary resection should be reserved for patients having definite symptoms over a long period. Pulmonary resection is indicated in the few patients presenting incapacitating symptoms and evidence of chronic debilitating disease after prolonged hospitalization.—Abstract



# Prolapse of Redundant Gastric Mucosa

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**P**ROLAPSE of redundant hypertrophic gastric mucosal folds through the pyloric ring into the duodenum is now recognized as a distinct clinical phenomenon. It was first reported by Von Schmieden (1) in 1911. Melamed and Hiller (2) in 1943 found 19 cases reported and added 1 of their own. Since then about 100 additional cases have been described (3) (4) (5) (6) (7) (8) (9) (10) (11). There is great variance in the clinical significance attached to the condition by different authors. Some feel that the roentgenologic appearance of a prolapse usually has no significance and so do not report it (12). Manning and Highsmith (7) believe that it is one of the clinical findings of hypertrophic gastritis and that it will respond well to the medical regimen used for peptic ulcer. Van Noate, Arnold, and Palmer (8) stress the importance of this diagnosis as an explanation for otherwise undiagnosed upper gastrointestinal symptoms. Others feel that the condition is a surgical entity requiring partial gastric resection or removal of the redundant mucosa and pyloroplasty (5) (13) (14). It would appear that this condition is being diagnosed at various stages corresponding to various degrees of prolapse and that the symptoms vary accordingly. Clinicians and roentgenologists should become cognizant of this entity and always include it in the differential diagnosis of upper gastrointestinal disease. Diagnoses will become more frequent as additional attention is directed to the disorder. The condition is shown schematically in figure 1.

## INCIDENCE

The reported incidence of the disease varies widely. Scott (3) found in his series of 1346 examinations of young men that prolapse of the gastric mucosa occurred as often as gastric ulcer. The wide variance of the incidence figures in table 1 may be caused by the severity of the prolapse in the cases reported. Rees (15) reports that three of his

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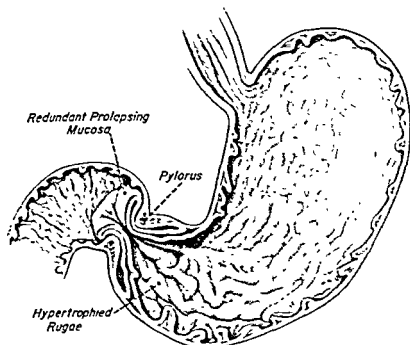


Figure 1—The hypertrophied mucosa of the antrum elongates and prolapses through the pylorus.

six cases were so severe that operation was required. Only three cases in Scott's group were operated on but 9 of the 14 have roentgenographic evidence of moderately large prolapses. In the larger series of 23 reported by Ferguson, only 4 were sufficiently extensive to warrant operation.

TABLE 1—Incidence of prolapsed gastric mucosa

Author	Clinic	Roentgenologic examinations of upper gastrointestinal tract	Prolapsed mucosa	Incidence (percent)
Rees	San Diego County Hospital and Reese-Leahy Clinic	5,550	6	0.19
Scott	U. S. Navy	1,346	14	1.04
Ferguson	Grady Memorial Hospital and Emory University Hospital	27	23	7
Van Noste et al.	Walter Reed General Hospital	90	10	1.04
Cove and Curphy	Curphy Clinic, Stockton, Calif.	650	22	3.38
Total		8,563	75	.85

### ETIOLOGY

The causative factors and sequence of events leading to redundancy and prolapse of the gastric mucosa have not been definitely established. The theories fall into three general classifications.

1. *Irritation, hypertrophy, and mechanical prolapse.*—Eliason and Wright (16) suggest that chronic irritation (either physical, nutritional, functional, chemical, or bacterial) produces a low-grade inflammation of the antral mucosa. This promotes the production of hypertrophied folds which enlarge and elongate through the pyloric ring on mechanical stimulation from hyperactive peristaltic waves. Bralow and Spellberg (17) believe that the irritation is a benign peptic ulceration located at the base of the duodenal bulb or in the prepyloric area. This ulceration is followed by gastritis, healing, and the production of hypertrophic mucosal folds which herniate with increased peristaltic activity.

2. *Narrowing of the pylorus, hyperperistalsis, loosened mucosa, and prolapse.*—Rees (15) has observed a narrowing of the pyloric lumen which he believes precedes mucosal change. The decrease in the size of the pyloric outlet stimulates hyperperistalsis. The hyperactivity of the peristaltic waves pushing stomach contents against a constricted orifice loosens the mucous membrane on the muscularis with resultant trauma, hypertrophy, and prolapse.

3. *Neurogenic stimulation, abnormal peristalsis, and forced prolapse.*—Scott (3) feels that the necessary structural conditions are inherent in the normal stomach and prolapse occurs only after the fibers in the flexible submucosa have been stretched and loosened by abnormal gastric peristalsis. This increased motility may be initiated by neurogenic or chemical stimuli produced by worry, excitement, irregular daily schedules, or excessive use of coffee, tobacco, or alcohol. He believes that such psychosomatic stimulation contributes more to prolapse than does preexisting disease of the gastric mucosa or of the pylorus.

#### PATHOLOGY

The pathologic changes involved are essentially a redundancy and increased mobility of the antral mucosa with varying degrees of hypertrophy and chronic inflammation. Rees (15) reports a narrowing of the pylorus with a fibrous degeneration of the muscular tissue. At times strangulation may cause the mucosal folds to become irritated and edematous, with superficial erosion and ulceration resulting in hemorrhage. Microscopically, the resected mucosal folds usually show some evidence of chronic gastritis with congestion of the vascular channels and lymphocytic infiltration of the lamina propria.

#### SYMPTOMS

Patients with this disorder do not present a characteristic group of complaints. This is to be expected in view of the wide variance in the extent of the prolapsed mucosa. Although pain, epigastric distress, fullness, nausea, and vomiting are imminent during the stage in which an elongated fold is forcibly herniated into the duodenum,



when the mucosa returns to the stomach only minimal discomfort is present. If the degree of prolapse is small, only a minor degree of obstruction and pyloric spasm exists and the complaints are less severe. Intermittent upper abdominal discomfort either aching or cramplike in character is the most consistent symptom. This may or may not be relieved by the ingestion of food. If appreciable obstruction is present, the distress with concomitant vomiting, occurs after eating. Scott (3) noted that epigastric distress in 10 of his 14 patients was relieved by food but not by alkalis. He believed that superficial ulcerations and vigorous gastric peristalsis that responded to the ingestion of bland foods were present. Secondary anemia caused by ulceration and oozing has been emphasized by Pendergrass (18). Usually asymptomatic periods and temporary improvement follow the use of antispasmodics and a bland diet. This is explained on the basis of intermittent herniation, with edema and mucosal irritation followed by reduction and the return of the prolapsed folds to a normal or nearly normal state. In every atypical ulcer history variability and intermittency of the symptoms should provoke suspicion of prolapsed gastric mucosa.

#### SEVERE GASTRIC HEMORRHAGE

The case report presented in this discussion emphasizes the importance of prolapsed mucosa in the etiology of severe upper gastrointestinal hemorrhage. In reviewing about 100 cases of prolapse now reported in the literature, it was found that 12 were complicated by severe hematemesis and melena. This is more than twice the generally accepted incidence (5 percent) associated with duodenal ulcers. Although the frequency of prolapse is not great, this condition may be the cause of many severe undiagnosed gastrointestinal hemorrhages.

#### DIAGNOSIS

Roentgenographic examination is required to establish a definite diagnosis. A central umbrella-like negative shadow appearing as a filling defect at the base of the duodenal bulb is typical. Inasmuch as the stage and degree of prolapse may vary at different times as well as at various periods of development, repeated roentgenographic examinations may be required to establish a definite diagnosis. If examination is performed in a quiescent period the mucosal folds may not prolapse through the pyloric ring to present the typical deformity. Multiple examinations preferably during an exacerbation of symptoms is recommended.

Scott has outlined the following important points of roentgenologic examination: (a) The filling defects in the duodenal bulb are invariably in the base, immediately around the pyloric opening; (b)

the redundant folds produce a lobulated mushroomlike negative shadow; (c) the filling defects vary in size and appearance in a single examination or on repeated examination because of the changes in the degree of prolapse, in contradistinction to the findings associated with duodenal ulcers which are constant during any one examination; (d) the redundant gastric rugae can be traced from the antral canal through the pylorus to the base of the bulb; (e) the duodenal bulb is not irritable with prolapsed mucosa, in contradistinction to the findings associated with an active ulcer; (f) gastric peristalsis is more vigorous than normal; (g) fluoroscopy must be supplemented by serial "spot films" or prolapse may be overlooked; and (h) although some authors (19) advise examination in the prone position, the prolapsed folds can be demonstrated with the patient erect. Pedunculated prolapsed gastric polypi are most often confused with prolapsed mucosa. Differential diagnosis must also include duodenal ulcer, papilloma of the duodenum, hypertrophic types of gastritis, and adult hypertrophy of the pyloric muscle.

#### TREATMENT

*Medical.*—The management of the patient with a mucosal prolapse depends on the extent of the lesion and the severity of the symptoms. In slight or moderate prolapse a thorough trial on a medical regimen is indicated. A bland diet of the ulcer-recovery type, antispasmodics, mild sedation, rest, relaxation, and freedom from tension may result in improvement. Unless such a complication as hemorrhage or obstruction is present, every patient should receive an adequate trial on medical therapy before surgery is considered.

*Surgical.*—The indications for surgery are:

(a) Obstruction: The more extensive prolapses usually show clinical or roentgenologic evidence of pyloric obstruction. Although gastric decompression and the administration of anti-spasmodics may afford temporary relief, surgery will eventually be necessary.

(b) Hemorrhage: Major hemorrhage or continued oozing giving rise to severe anemia warrants surgery.

(c) Persistent symptoms after adequate medical therapy: The majority of the cases will fall in this group. If the lesion is diagnosed early before the prolapse has progressed, medical management may suffice for some time but with further development of the herniation, persistent epigastric pain and distress will result and surgery will be required. Once the diagnosis is established, all uncomplicated cases should be given an adequate trial on medical therapy before surgery is considered.

(d) Equivocal roentgenographic findings: The most difficult lesions to differentiate from prolapsed mucosa are the prolapsed peduncu-

lated gastric tumors or polyps. Whenever there is doubt about the presence of a pedunculated tumor, surgical exploration is required to rule out malignancy.

Several types of operation, including gastrojejunostomy, partial gastrectomy, pyloroplasty, and simple excision of the redundant mucosa have been tried. Rees (15) suggests gastrotomy, excision of the redundant mucosal folds, anchorage of the mucosa to the underlying muscularis, and pyloromyotomy. More recent opinions favor simple removal of the excess mucosa followed by a Heineke-Mikulicz or a Finney type of pyloroplasty (3) (4) (5). The case reported in this article was satisfactorily treated by a longitudinal incision of the anterior pylorus, excision of the redundant folds followed by hemostatic suturing of the mucosa, and transverse closure of the pyloric incision.

### CASE REPORT

A 31 year-old sergeant had a gross gastric hemorrhage on 4 October 1946. After immediate admission to an Army general hospital, four subsequent bouts of hematemesis ensued which caused unconsciousness for 3 days. After repeated transfusions he was given a bland diet, aluminum hydroxide, belladonna, and phenobarbital for the remainder of his 7-month period of convalescence in the hospital. In this period repeated roentgenologic examinations of the entire gastrointestinal tract and gastroscopy revealed no abnormality. While on the above medical regimen, he had no hematemesis, melena, or vomiting but noticed some vague epigastric distress. Medical therapy was continued until October 1947. In February 1948 he began to vomit and to have a feeling of fullness in the upper abdomen. A wave of nausea followed by immediate vomiting would appear suddenly, 1 or 2 hours after meals, with no untoward reaction thereafter. These attacks occurred as often as once a day. Repeated roentgenologic examinations of the upper gastrointestinal tract again revealed nothing abnormal. He returned to a medical ulcer regimen with intermittent relief for 6 months. The symptoms then became more persistent and on 16 August he was admitted to this hospital.

Roentgenographic examination revealed a mushroomlike deformity at the base of the duodenum with irregularity of the mucosal contour of the pylorus (fig. 2). There was no anemia or loss of weight. The 12-hour nocturnal gastric secretion was 830 cc. The free acidity was 36 ml., and the total acidity was 54 ml. His alcoholic and tobacco consumption had always been minimal. There was a 6-year history of domestic difficulty and moderate evidence of nervous instability. Previous severe gastric hemorrhage, and failure of 18 months of medical therapy, were indications for operation. On 24 September, through a transverse abdominal incision the anterior pylorus was opened longitudinally. A 2-cm fold of gastric mucosa extended around the circumference of the pyloric outlet and passed into the duodenum. There was no edema of the mucosa or fibrous thickening of the pyloric musculature. The redundant fold was excised and the mucosa sutured to the underlying muscularis for hemostasis. The longitudinal opening was closed transversely as a classical Heineke-Mikulicz pyloroplasty. The patient was ambulatory the day after the operation and on the tenth postoperative day was discharged on an ulcer-recovery diet. Later roentgenographic examination showed no evidence of further prolapse. When last seen in March 1949 he was symptom-free.

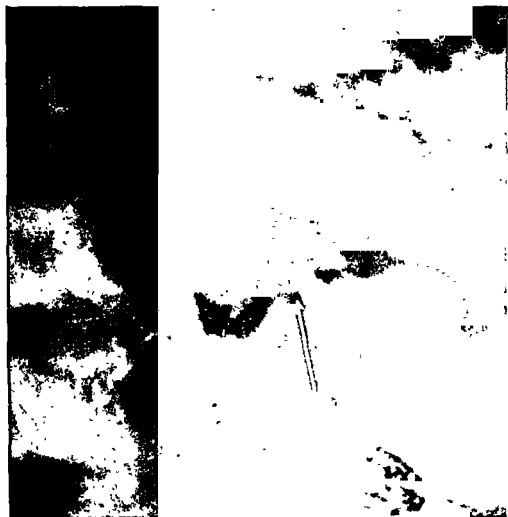


Figure 2.—Roentgenogram of upper gastrointestinal tract. Arrow indicates the characteristic umbrella-like dark shadow at the base of the duodenum.

Pathologic examination of the resected mucosa revealed a small amount of hemorrhagic exudate on the surface. The epithelium was intact and the mucus-secreting cells in the deeper portion appeared somewhat distended. The lamina propria exhibited some lymphocytic infiltration and engorgement of the smaller vascular channels. These findings are compatible with chronic gastritis.

#### SUMMARY

An increasing number of cases of prolapsed gastric mucosa are being reported. Additional emphasis in the literature brings this entity to the attention of more physicians with a resultant increase in the frequency of diagnosis. The etiologic factor is still obscure. The predominant change is a redundancy and mobility of the gastric mucosa with some degree of hypertrophy and chronic inflammation. The symptoms vary with the severity of the disease. Intermittent epigastric distress and vomiting predominate. Severe hemorrhage occurs in about 12 percent of the cases. Prolapsed mucosa may be

the cause of many presently undiagnosed hemorrhages of the upper gastrointestinal tract.

Roentgenographic examination establishes the diagnosis. A central mushroomlike negative shadow of the base of the duodenal bulb is typical. Medical therapy consisting of a bland diet, antispasmodics, sedation, and rest may suffice in the less severe cases. Surgery is indicated when medical management fails or when hemorrhage, obstruction, or equivocal roentgenographic evidence of pyloric tumor is present. Resection of the mucosal folds, combined with some type of pyloroplasty, gives uniformly good results.

#### REFERENCES

1. VON SCHMIEDEN. Cited by Archer and Cooper (15)
2. MELAMED, A., and HILLER, R. I. Prolapsed gastric mucosa: roentgenologic demonstration of ulcer crater in prolapsed polypoid mucosa. *Am J Digest Dis* 10: 91-95, Mar 1943
3. SCOTT, W. G. Radiographic diagnosis of prolapsed redundant gastric mucosa into the duodenum with remarks on clinical significance and treatment. *Radiology* 46: 547-568, June 1946
4. MACKENZIE, W. C., MACLEOD, J. W., and BOURCHARD, J. L. Trans-pyloric prolapse of redundant mucosal folds. *Canad M A J* 54: 553-558, June 1946
5. FEROTSON, I. A. Prolapse of gastric mucosa, report of 6 cases. *Ann Surg* 127: 879-886, May 1948
6. APPELBY, L. H. Prolapsing gastric mucosa. *J Internat Coll Surgeons* 10: 133-141, Mar-Apr 1947
7. MANNING, I. H. JR., and HIGHSMITH, G. P. Prolapse of gastric mucosa through the pyloric canal into duodenum: report of 16 cases diagnosed roentgenologically. *Gastroenterology* 10: 643-659, Apr 1948
8. VAN NOATE, H. F., ARNOLD, W. T., and PALMER, E. D. Clinical and gastroscopic observations on prolapse of gastric mucosa. *Rev Gastroenterol* 15: 696-701, Sept 1948
9. NORCOW, M., and SHUTER, I. J. D. Extrusion of gastric mucosa through pylorus, report on 2 patients treated by partial gastrectomy. *Surgery* 18: 452-457, Oct 1945
10. ZACHO, A. Relaxation of gastric mucosa producing pyloric obstruction. *Arch Surg* 57: 47-50, July 1948
11. COVE, A. M., and CURPHEY, W. C. Prolapse of redundant gastric mucosa. *Surg, Gynec & Obst* 88: 108-114, Jan 1949
12. ALVAREZ, W. C. Cited by Bralow and Melamed (14)
13. ARCHER, V. W., and COOPER, G. Prolapse of gastric mucosa. *South M J* 32: 252-256, Mar 1939
14. BRALOW, S. P., and MELAMED, M. Prolapse of redundant or hypertrophied gastric mucosa. *Am J Digest Dis* 14: 217-221, July 1947
15. REFS, C. E. Prolapse of gastric mucosa through pylorus; surgical treatment. *Surg., Gynec & Obst* 61: 649-654, Mar 1937
16. ELIASON, E. L., and WRIGHT, V. W. M. Benign tumors of stomach. *Surg, Gynec & Obst* 41: 461-472, Oct 1925
17. BRALOW, S. P., and SPETZBERG, M. A. Etiology of prolapsed gastric mucosa, with illustrative case report. *Am J. Digest. Dis* 14: 332-337, Oct 1947

18. PENDERGRASS, E. P.: Prolapse of pedunculated tumors and gastric mucosa through pylorus into duodenum; roentgenological diagnosis. *J. A. M. A.* 91: 317-321, Feb 1, 1930
19. PENDERGRASS, E. P., and ANDREWS, J. R.: Prolapsing lesions of gastric mucosa. *Am. J. Roentgenol.* 31: 337-350, Sept 1935.



**GASTROINTESTINAL GAS: Observations on Belching During Anesthesia, Operations and Pyelography; and Rapid Passage of Gas, by W. G. Maddock; J. L. Bell; and M. J. Tremaine. *Annals of Surgery* 130: 512-537, Sept. 1949.**

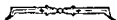
There is nothing new in the idea that external air enters the esophagus under many conditions and is the major source of gastrointestinal gas. It appears in the upper alimentary tract of infants within 15 minutes after birth and the roentgenographic findings of air in the bowel has been suggested as a test for extra-uterine life.

Normally the superior esophageal sphincter keeps the esophagus closed. With swallowing movements the sphincter relaxes and air enters with fluid and food. In the upright position the air collects at the stomach, and when more than the usual amount accumulates, as with a meal, it is belched up. Alvarez remarked that hundreds of patients can be examined with the fluoroscope before finding one with enough air in the stomach to be worthy of special comment. \* \* \* appreciable volumes of air enter the stomach by repeated belching. In the upright position the air is trapped in the cardia and nothing more disturbing than further eructations result, but when prone the air may pass on and cause trouble. A patient with marked gastrointestinal distention from repeated belching is reported.

Patients undergoing anesthesia and operation were found to swallow infrequently, and little gas was aspirated from the stomach of the majority studied. Considerable gas was aspirated from the stomachs of five patients during an operation under cyclopropane anesthesia plus curare. Each was considered to have a partial paralysis of the respiratory muscles due to the curare and positive pressure anesthesia used. With curare the superior esophageal sphincter was probably well relaxed and the positive pressure forced gas into the stomach.

An excellent opportunity for studying rapid accumulations of intestinal gas was offered by patients undergoing pyelography. By continuous gastric suction considerable volumes of air were aspirated from the stomach, and when it was kept empty no increase in intestinal gas occurred. This is further evidence that external air is a major source of gastrointestinal gas.

The finding that continuous gastric suction prevented the meteorism of pyelography is the same as continuous gastric suction preventing postoperative distention. There is every reason to believe that patients under many conditions become temporary aerophagics and the stimulus may be entirely nervous without organic origin or be associated with an organic disease or injury and its treatment.—*Abstract.*



# Superior Vena Cava Obstruction

## Review and Report of Two Cases

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THE superior vena cava syndrome is produced by any lesion which interferes with the flow of blood through the superior vena cava without a corresponding interference with the blood flow through the inferior vena cava. William Hunter (1) provided the first authentic description of superior vena cava obstruction in 1757. From that time until 1946, 524 cases have been reported (2); however, it is believed that the condition is much more common than the number of cases reported would indicate.

Any lesion which interferes with the blood flow through the superior vena cava directly or indirectly either by bilateral innominate vein obstruction or arteriovenous fistula between the ascending aorta and the superior vena cava, will produce the superior vena cava syndrome. The clinical picture is characterized by increased venous pressure in the areas drained by the superior vena cava, increased circulation time, the formation of collateral venous channels, and the presence of an obstructing lesion.

The syndrome occurs more frequently in men and the incidence is highest between the ages of 30 and 60, since the more common etiological factors—bronchogenic neoplasm, syphilitic aortitis, and malignant lymphoma—are more prevalent in men of this age group.

McIntire and Sykes (2) reviewed the literature and found malignant primary thoracic tumors, aneurysm, and chronic fibrous mediastinitis responsible for the obstruction in 75 to 80 percent of cases. Uncommon conditions which have been reported as a cause of superior vena cava obstruction include propagation thrombi, localized phlebitis with thrombus formation, tuberculous phlebitis, actinomycosis, benign thoracic tumors, metastatic malignant lesions of thoracic organs or breaking into a tributary of the superior vena cava and growing into the superior vena cava.

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The large veins of the superior mediastinum are thin-walled and carry blood under low pressure, consequently the vessels are easily compressed and circulation through these vessels is readily impaired by space-filling lesions of the immediately surrounding structures.

The prognosis and the degree of invalidism depends upon the efficiency of the collateral systems.

There are four collateral routes for shunting the venous blood from the upper half of the body to the right auricle when the superior vena cava is obstructed. These are the internal mammary, the vertebral, the azygos, and the lateral thoracic (3).

The special studies indicated in patients with clinical evidence of superior vena cava obstruction include venous pressure studies, circulation times, phlebography, and infrared photographs. The venous pressure in the antecubital vein is greatly increased bilaterally while the venous pressure in the femoral vein is normal. A variation in the venous pressure of the arms with an increase in one arm is believed to indicate that there is an obstruction on that side in one of the tributaries to the superior vena cava, in addition to vena cava obstruction (4). Normally the venous pressure falls slightly on inspiration and rises slightly on expiration. When the respiratory effect on the venous pressure is reversed the obstruction is complete and lies below the entrance of the azygos into the superior vena cava. The arm to throat circulation time in superior vena cava obstruction is increased but not necessarily in proportion to the venous pressure. In the majority of cases where the venous pressure and the circulation time were reported, the circulation time was found to be disproportionately short. Phlebograms are of great value in outlining and evaluating collateral circulation, and at times will localize the site of the obstruction.

#### CASE REPORTS

*Case 1.*—A 23-year-old white man was admitted to the U. S. Naval Hospital, Philadelphia, Pa., on 16 March 1949, complaining of pain in the right chest of 3 weeks' duration. The patient believed himself to be in good health until December 1944 when he noted aching and swelling in the right leg which was thought to be due to varicose veins and these were treated with sodium morrhuate injections. The patient became symptom-free and remained well until December 1947, except for slight swelling and aching of the right leg after prolonged standing or walking. In December 1947, he noted a slowly progressive swelling in the left popliteal space which was associated with pain and swelling of the left leg. On 21 February 1948, an aneurysm was excised from the left popliteal space. At the time of operation extreme tortuosity of the veins in the popliteal area was noted. During June 1948, generalized edema of the neck and face was present on arising and gradually subsided during the day.

During October 1949, he first noted prominence of the superficial anterior chest veins. For 3 months prior to admission he was aware of light-headedness and bluish discoloration of the face upon exertion or bending over.

His family and past medical histories were noncontributory. The systemic review was negative except for a 17-pound weight loss during the 6 months prior





Figure 1



Figure 2—Venogram of right axilla and chest.

to admission, and the infrequent occurrence of hard painful nodules along the superficial veins of the lower extremities.

Physical examination upon admission revealed a well-developed, fairly well-nourished young man not in acute distress. The pulse was regular (100) and the blood pressure was 115/75. The hands were bluish red with cyanotic nail beds. The superficial veins of the arms and legs were very prominent and those of the anterior chest and ventral abdominal wall were tortuous, dilated, and filled from above (fig. 1).

The remainder of the physical examination including fundoscopic examination was negative except for absence of the supraclavicular fossae.

Circulation time, using calcium gluconate intravenously, was: left arm to throat, 24 seconds; right arm to throat, 31 seconds; and left femoral to throat 15 seconds.

Venous pressures were: left arm, 300 mm H<sub>2</sub>O; right arm, 280 mm H<sub>2</sub>O, and left femoral, 90 mm H<sub>2</sub>O.

A venogram of the right axilla and chest showed "no evidence of filling of the right axillary, subclavian, innominate, or superior vena cava. However, a rich anastomosis is demonstrated via the intercostal, internal mammary, and azigos veins close to the right axilla, where the opaque medium is presumed to have entered the heart" (fig. 2).

A venogram of the left axilla and chest showed a rich anastomosis of blood vessels in the lower two thirds of the left half of the thorax. However, no opaque medium reached the left axillary, subclavian, or innominate veins.

All other laboratory studies were negative.

This case is believed to characterize the superior vena cava syndrome caused by a thrombus of the superior vena cava with extension distally to the innominate and axillary veins. The pathogenesis of the thrombus formation was not determined, however, the most logical basis was visceral thrombophlebitis migrans, as reported by Gerber and Mendlowitz (5).

*Case 2*—A 33-year-old white man was admitted to the United States Naval Hospital, Philadelphia, Pa., on 26 April 1949 complaining of painful, swollen joints. He had considered himself to be in good health until 4 months prior to admission when he had swelling and pain on motion of the right shoulder joint. In addition in the preceding 4 months he had swelling of the right hand and both ankles at intervals with associated anorexia, weakness, and weight loss.

*Past medical history:* He had had a ruptured peptic ulcer which was repaired surgically. He takes three "shots" of whiskey per day.

*Physical findings.* His temperature was 100.4° F., pulse, 120; and his blood pressure was 110/80. There was swelling and edema of the right arm and shoulder, with muscle spasm, increased skin temperature, and pain on motion. There was swelling and tenderness of the right foot and ankle.

*Laboratory findings:* The urine was normal; the blood Kahn test was negative; the white blood cell count was 26,500 per cu. mm., 58 percent polymorphonuclear neutrophils, 20 percent band forms, and 22 percent lymphocytes. The red blood cell count was 3.62 million per cu. mm.; hemoglobin was 10.5 gm.; blood sedimentation rate was 31 mm./30 min.

The initial impression was that the patient had rheumatoid arthritis, and salicylate therapy was instituted with a subsidence of the febrile state and subjective improvement. This drug was discontinued after 3 days because of severe tinnitus.

On 5 May 1949, the patient complained of severe pain in the right axilla which was exaggerated on inspiration and 4 days later periorbital edema and swelling of the anterior neck and face were noted.

Röntgenograms of the chest on 12 May 1949, revealed "a rounded area of density occupying the apical portion of the right upper lobe" (fig 3). The swelling of the face and neck persisted and fullness of the veins over the anterior wall was noted which suggested that partial obstruction of the superior vena cava was present. Also, palpable, nontender lymph nodes appeared in both axillas; biopsy showed "fibrosis of lymph node." Broncho-copic examination and Papanicolaou stain of the secretions revealed no abnormalities. The electrocardiogram was within normal limits.

Venous pressures were: left antecubital vein, 520 to 540 mm. of sodium citrate with normal variation with respiration, right antecubital vein, 480 mm. of



Figure 3.—Roentgenogram of the chest (12 May 1949).



Figure 4.—Venogram of the chest.

# Hip Nail Corrosion

JACOB KUROWSKI, *Commander (MC) U S N R.*

BY PRESENT-DAY metallurgical standards, one expects progressive corrosion in any steel implant in bone which differs essentially from so-called 18-8 SMO stainless steel. This was not uniformly the case in three fractures of the neck of the femur which were observed about 12 years after pinning with what was then known as 420 stainless steel Smith-Petersen nails (table 1). Instead, there was marked corrosion in one nail, minimal corrosion in the second, and no corrosion in the third. These singular "bio-mechanical" incidents form the basis of this report.

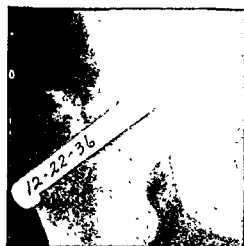
TABLE 1

	18-8 SMO stainless steel <sup>1</sup>	420 stainless steel
Chromium	17-20 percent	12-14 percent
Nickel	10-14 percent	
Molybdenum	2-4 percent	
Manganese	2 maximum	0.50 maximum
Silicon	0.75 maximum	0.50 maximum
Carbon	0.08 maximum	Over 0.15
Phosphorus	0.03 maximum	0.025 maximum
Sulfur	0.03 maximum	0.025 maximum

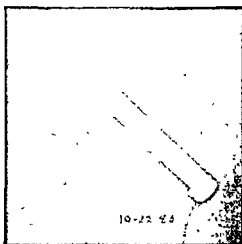
<sup>1</sup> Specifications for 18-8 SMO. It shall have a hardness of not less than 30 nor more than 35 as determined by the Rockwell hardness tester using the 'C' scale and the 150-kilogram load on the diamond cone penetrator.

## CASE REPORTS

**Case 1**—M C was 61 years old in 1936 when her hip fracture (valgus deformity) was nailed by an open Whitman approach (fig. 1*A*). Seven years later she had a disabling coxalgia which subsided somewhat with crutch walking in the next 2 years. Roentgenograms taken about 10 years after operation showed metallic corrosion with associated bone and joint changes (fig. 1*B*). One year later the patient walked without support. Roentgenograms taken 12 years after operation did not reveal further corrosion. Six weeks later the patient fell and sustained a subtrochanteric fracture of the normal hip. When this fresh fracture was operated upon, the corroded nail was also removed. Its head was covered by a dense fibrous capsule, excision of which permitted the nail to slip out easily. Curettement of the nail canal obtained a darkly pigmented

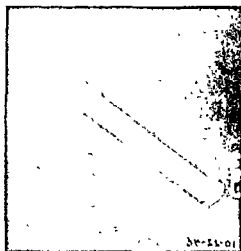


A



B

*Figure 1.—Case 1. (A) Roentgenogram of the right hip, 10 weeks after open operation. (B) and (C) Same hip, anteroposterior and lateral views, 10 years after operation and 3 years after onset of coxalgia. Note metallic corrosion shaft of nail, widening of pin canal (fibrous capsule prevented extrusion of nail), increased density of femoral head, inferior condyle ossification, and thinning of the joint cartilage.*



C

granulomatous tissue, microscope examination of which showed old hyaline fibrous tissues heavily stained with golden brown pigment for the most part, but also showed various other stains, suggesting foreign material. The nail was blackened and partly encrusted (fig. 2) with a granular material which was easily scraped off. Light sanding revealed a fairly polished surface except for some small pits and linear erosions. Only the manufacturer's name, which had been most deeply impressed, was practically effaced. Moreover, this flange showed the most extensive destruction.

*Case 2*—C. H. was 60 years old when her subcapital fracture (varus deformity) was nailed blindly early in 1937. She has remained asymptomatic. Roentgenograms taken 10 years after operation showed minimal corrosion near the head of the nail. Roentgenograms taken 2 years later showed no further damage.

*Case 3*—R. Z. was 47 years of age in 1936 when his fracture (neck of femur with varus deformity) was blindly nailed in marked valgus (fig. 3A). A painful limp came on gradually several years later and became progressively worse.

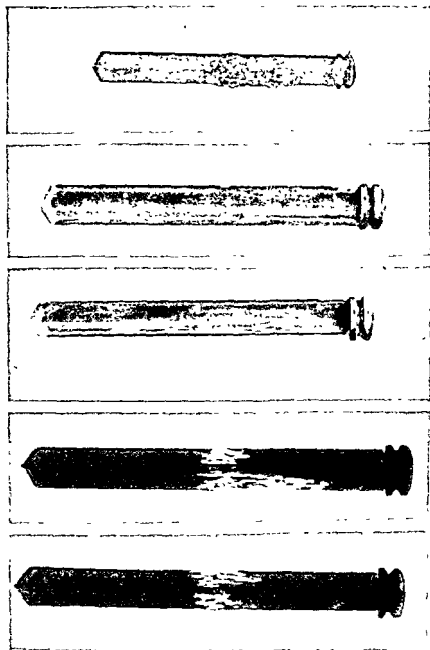


Figure 2—Case 1 Reading from top to bottom. Blackened encrusted nail at time of removal, two weeks after light sanding, and roentgenograms of the specimen

Roentgenograms (fig. 3*B*) taken about 10 years after operation showed absence of corrosion and marked aseptic necrosis of the femoral head. This did not progress further 2 years later, at which time he was actively engaged in farming.

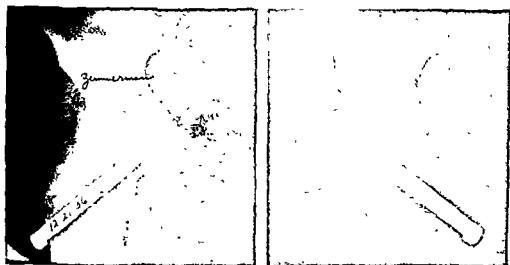


Figure 3.—Case 3. (A) Roentgenogram of hip, 2 months after blind nailing, with femoral head in extreme valgus deformity. (B) Same hip 10 years after operation. There is marked aseptic necrosis of femoral head and absence of corrosion.

#### COMMENTS

It seemed certain on the strength of case 1, that cases 2 and 3 would follow the same pattern of corrosion because the chemical composition of 420 stainless steel does not meet the requirements of bone surgery. Scheer's (9) definition of corrosion ("a destruction of a solid by 'unwished' chemical or electro-chemical attack originating from the surface") helps to explain the discrepancy. Therefore, rustlessness is not unconditionally an inherent quality but essentially an acquired one, for among other things such as homogeneous structure and proper chemical composition, it depends on the surface finish or protective coating. By alloying the steel with chromium a very thin but indestructible film of chromium oxide is formed to protect the steel against further attacks from the oxygen. It is absolutely necessary, however, that the surface be perfectly smooth and free from impurities, otherwise this protective film is not effective. The relative importance of proper surface finish is best illustrated by an early experience of the writer. The marked surface corrosion in that instance occurred in an unpolished stainless steel nail of unknown composition and was removed from the body less than 3 months after insertion in a 51-year-old woman (fig. 4). The nail had ploughed upward out of the femoral head and neck with resultant nonunion, considerable scarring, and

local brown to black discoloration of the bone and soft tissues, microscopic study of which showed transition into osteoid, osseofibrous, and dense fibrocartilaginous tissue. The softer tissue was pervaded by vascular channels and simple cells, both occupied by extremely hypertrophic, hyperplastic spindle cells which varied in form (frequently quite swollen) and stained with a brownish to greenish black pigment. The latter apparently contained activated fibroblasts and scavenger endothelial cells loaded with iron from broken-down blood cells and other pigment. The changes were indicative of tissue metaplasia from minimal trauma and irritation.

No special stains were made to determine the origin of the pigment in either of these cases. It was thought, however, that the pig-

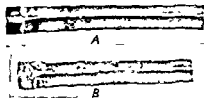


Figure 4.—(A) Unpolished stainless steel nail of unknown composition  
(B) Similar nail removed less than 3 months after insertion

ment was derived both from the iron of the red blood cells and iron of the stainless steel. In Raagaard's (8) case, special staining and chemical tests showed that the pigment, which was partly free in the tissues and partly located in wandering cells, was due chiefly to the nail. The special stain reaction with diphenylcarbozide revealed chromium in the tissues. Felsenreich (2) stated that the

iron pigment derived from stainless steel occurs in the form of an organic iron. On the other hand, since the pigment noted by Wise (12) occurred in a specimen wherein a vitallium nail had been used, he argued that the iron pigment he noted must have been formed from the red blood cells because there is no iron in vitallium.

However important surface finish may be, the self-limited corrosion in depth notable in case 1 strongly suggested another deficiency; namely, that there was a structural inadequacy, as was proved in Raagaard's case. The latter corroded specimen had been removed from a 64-year-old man 15 months after insertion. The low chromium and carbon content of this nail closely approximated that of 420 stainless steel (0.45 percent carbon and 12.2 percent chromium). Microscopic examination showed faulty finish, numerous blisters, and impurities. Free carbides and considerable oblong slag deposits, showing that the nail had been made from rolled or drawn material, were found. Raagaard concluded that corrosion of his nail was due to a combination of faulty finish, excessive slag, and insufficient chromium.

Did mechanical stress have anything to do with the corrosion noted in cases 1 and 2? Speed (10) in 1935 asked the same question in regard to a similar case of his own. This question is a pertinent one since in case 3, in which virtually all shear had been eliminated by the extreme valgus deformity of the head after reduction and pinning, there was no corrosion. According to Pauwels (7), the torque in the femoral head fluctuates in walking between 0-248 kilos during fractions of a second. This, according to him, causes steel to "exhaust" and eventually to break. Be that as it may, since there was no notable distortion of the nails, and since corrosion apparently did not set in until long after bony union had occurred, it does not seem probable that stress had anything to do with the corrosion in cases 1 and 2.

Another factor, which may have been of some importance in limiting or preventing corrosion, is the encapsulating membrane which forms about hip nails (fig. 5). This was first mentioned by Engel (1) who suggested that it aided in revascularizing the femoral head. Wise also described a grayish membrane in connection with a vitallium nail. The membrane developed as early as 43 days after insertion of an 18-8 SMO stainless steel pin in a post-mortem specimen (5). On the clinical side, successive roentgenograms show that these membranous canals become invariably widened distally and are always demarcated by a line of increased density and/or by well-defined rounded cystic areas about the head or point of the nail. The disruption of the canal and the pronounced atrophy and decalcification observed in case 1 were therefore especially notable and must have been due to a granulomatous inflammatory bone tissue reaction as a result of chemical and physical agents (3) incident to the corrosion. Felsenreich (2) refers to this reaction as "rust granulomata" and states significantly that these may be "recaptured" by fatty tissue and bone, if the nail is removed.



Figure 5.—Post-mortem specimen in a 63-year-old woman, about 3 months after operation, showing fibrous lining of pin canal.



Finally it may be asked, "What caused the bone and joint changes in cases 1 and 3?" In case 1, the aseptic necrosis must have been due in great part to an interference with the blood supply to the femoral head by the granulomatous infiltration of the femoral neck. In case 3, there must have been a mechanical vascular occlusion following reduction to a valgus position. It is to be remembered in this connection that triangular areas of aseptic necrosis of the femoral head frequently occur shortly after the initial trauma in this type of fracture; therefore, it may be concluded that uncomplicated steel implants here have little or no direct bearing to subsequent bone and joint changes which may occur.

### CONCLUSIONS

1. The minimal corrosion in case 2 and the absence of corrosion in case 3 emphasizes the importance of proper surface finish (4).
2. It is possible that there is an "x" factor in corrosion which varies with different patients.
3. Bony union is irreversible in the presence of corrosion and is not affected by aseptic necrosis of the femoral head (6).
4. Bony union does not prevent metallic corrosion later.
5. Nails should be removed after bony union has occurred in order to prevent late corrosion and to enhance complete physiological restoration of the femoral neck and head.

### REFERENCES

1. ENGEL, G. C. Fractures about hip. *S. Clin. North America* 20: 1721-1940.
2. FELSENEICH, F. Histologische Untersuchungen an operierten Schenkelhalsbrüchen: die Rolle des 3-Lamellennagels als Fremdkörper. *Arch. f. klin. Chir.* 194: 584-620, 1939.
3. FORPUS, W. D. Granulomatous Inflammation. Charles C Thomas, Springfield, Ill., 1949.
4. HARRIS, R. L. Experiences with internal fixation in fresh fractures of neck of femur. *J. Bone & Joint Surg.* 20: 114-123, 1938.
5. KULOWSKI, J., and LUCK, J. V. Microscopic changes after internal fixation of transcervical fracture of femur. *J. Bone & Joint Surg.* 23: 17-22, 1941.
6. PALMER, I. Über die Anheilungsbedingungen der medialen Schenkelhalsbrüche nach Osteosynthese mit einem Nagel aus rostfreiem Stahl, illustriert durch eine histologische Untersuchung. *Acta chir. Scandinav.* 75: 416-470, 1934.
7. PAUWELS: Quoted by Raagaard (8).
8. RAAGAARD, O. Some comments on complications occasioned by rustless surgical nail. *Acta chir. Scandinav.* 52: 475-486, 1939.
9. SCHREER: Quoted by Raagaard (8).
10. SPEED, K. Unsolved fracture. *Surg. Gynec. & Obst.* 60: 341-352, Feb. (No. 2A) 1935.
11. VENABLE, C. S., and STUCK, W. G. Internal Fixation of Fractures. Charles C Thomas, Springfield, Ill., 1947.
12. WISE, R. A. Histological study of transcervical fracture of femur after internal fixation. *J. Bone & Joint Surg.* 23: 941-947, 1941.

# Visceral Leishmaniasis

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VISCERAL leishmaniasis, as in the United States, is not endemic in Japan. However, this disease has been diagnosed in a small number of Japanese who have returned to their homeland after military assignments in such highly endemic areas as China and India. An analogous situation has been seen in this country. A large proportion of these patients will show a satisfactory response to pentavalent antimony, but some will have repeated relapses after several courses of apparently adequate amounts of this drug. It is in such cases that stilbamidine may be indicated. Stilbamidine is a non-antimony compound that, in a limited series of cases in the United States, has given encouraging results in the treatment of antimony-resistant cases of visceral leishmaniasis. The general use of this drug has been limited by the relatively frequent occurrence of a trigeminal neuralgia that results from a toxic degeneration of the principal sensory nucleus of the trigeminal nerve, usually appearing 2 to 5 months after treatment. The numbness, formication, and itching slowly subside, but the dissociation anesthesia, which is evidenced by a loss of sensation to light touch may persist. The following case of visceral leishmaniasis was resistant to antimony but was successfully treated with stilbamidine. It was the first case in Japan to be treated with this drug.

## CASE REPORT

A 35-year-old Japanese veteran, while stationed in Northern China from May 1913 until June 1944, was observed for pulmonary tuberculosis. Study failed to reveal active infection, but in June 1944 he was returned to Japan for medical discharge. He felt well on his return to Japan until November 1947, when he complained of fever, abdominal swelling, and weakness. Physical examination revealed a poorly nourished man who appeared to be chronically ill. The oral temperature was 39.5° C. There was distinct pallor of the skin and mucous membranes and bleeding of the gums. The lungs were clear to percussion and auscultation. There was extreme protuberance of the abdomen. The liver was

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interruption of treatment. After the fifth injection there was a subjective feeling of improvement. After the fifteenth injection the temperature became normal and remained so except for one 4-day period in February 1949 when the patient developed an upper respiratory infection. There was palpable softening of the spleen after the eighteenth injection. Since the completion of treatment there has been great subjective and objective improvement in the patient's condition. Within 2 weeks after the last injection the liver was no longer palpable. There was a rapid diminution in the size of the spleen. Within 3 months only the tip of the spleen could be palpated (fig 2). The patient rapidly regained his strength and was capable of light work.

A summary of the progressive changes that occurred in this patient's blood picture in the 9-month period following the initiation of stilbamidine treatment is shown in table 1. In that period multivitamins and ferrous sulfate were given and on 10 February hexylresorcinol was given for ascariasis.

TABLE 1—*Progressive changes in the blood of a patient with visceral leishmaniasis after treatment with stilbamidine*

Date	Erythrocytes	Leukocytes	Hemoglobin	Sedimentation rate	Formol gel test
	Million		Percent	Mm per hour over 130	
1948					
1 Nov	1.42	3,100	37		4 plus
8 Nov	1.55	2,620	28		
15 Nov	1.42	2,800	32		4 plus
3 Dec	2.88	4,700	52		3 plus
13 Dec	2.94	4,800	53		
22 Dec	2.96	5,100	59		
1949					
7 Jan	3.15	7,000	69		
25 Jan	3.49	7,750	72		
10 Feb	3.53	10,500	73	130	
22 Feb	3.60	11,800	78		1 plus
16 Mar	3.60	8,660	85	70	
24 Apr	3.68	7,940	90	22	
8 June	3.92	7,250	89	13	
4 July	4.40	9,000	88	9	
14 Aug	4.45	5,800	90	7	Negative

### CONCLUSION

Visceral leishmaniasis must be considered in any patient who has lived in an endemic area and later develops anemia, leukopenia, and hepato-splenomegaly. Such a problem may be confronted in veterans who have served in China, India, and Turkey.



# Unusual Foreign Body in Conjunctiva

## Report of a Case

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**V**EGETABLE foreign bodies which become imbedded in the conjunctiva are common and are usually removed promptly. If such an object is not discovered shortly after the injury, the ensuing symptoms of eye discomfort and inflammation are usually so severe that removal is made necessary within a few days. A vegetable foreign body would rarely remain unnoticed for over a week.<sup>2</sup>

### CASE REPORT

A 19-month-old boy was referred in June 1949, for investigation of a "growth" on the left eyeball. The mother stated that she first noticed a red mass partially covering the left eye about 1 week earlier. A slight mucoid discharge had been present for a month. There had been no redness or swelling of the lids or globe. The child had been well generally but had not opened the left eye as widely as the right since an injury at the age of 6 months. Thirteen months earlier (May 1948), while playing on the lawn in San Diego, Calif., he fell into some freshly cut grass. The child cried continuously and the mother examined the left eye, discovering what appeared to be a grass seed imbedded in the globe near the lateral canthus. After removing the foreign body the child was taken to a hospital where further examination revealed an abrasion of the lateral bulbar conjunctiva. No other foreign bodies were found. All redness disappeared after several days and there were no further eye complaints except a mild mucoid discharge from the left eye accompanied by acute attacks of nasopharyngitis on two occasions. The discharge disappeared with the use of boric acid solution eye drops.

Examination revealed apparently normal vision and slight narrowing of the left palpebral fissure. External examination of the left eye showed a tongue-like, soft, red tissue mass protruding from the upper angle of the inner canthus and loosely flapping over the medial half of the cornea. Under ether anesthesia the mass was found to be freely movable, friable, and attached by a narrow

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<sup>2</sup> SPARTI, F. H.: *Principles and Practice of Ophthalmic Surgery* 4th edition Lea & Febiger, Philadelphia, Pa., 1948 p. 509.

# Treatment of Creeping Eruption With Hetrazan

## Report of 13 Cases

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**C**REEPING eruption is a term applied to a number of diseases of the skin characterized by tortuous migratory lesions produced by the burrowing of larvae. Persons who walk barefoot on the beaches, children in sandboxes, and plumbers and carpenters who work under houses are often victims. The majority of cases in this country are due to the penetration of the skin by larvae of the cat-and-dog hookworm. The disease is endemic along the Atlantic coast, particularly in Florida and Georgia, but has been reported as far north as the coast of New Jersey.

The present accepted treatment consists of freezing the affected areas with ethyl chloride spray or injections of fuadin. Shelmire (1) is credited with being the first to propose the use of ethyl chloride spray and Smith (2) was the first to suggest the use of fuadin. Both treatments, although usually effective, leave much to be desired. Ethyl chloride must be used until the skin is firm and can be picked up between the fingers like cardboard. Multiple treatments are usually necessary. Children often are affected about the genitals, buttocks, feet and toes, and these areas are difficult to treat and the procedure is quite painful. The young patients are brought screaming to the doctor's office and several people are needed to hold the victim. The skin is often macerated and secondarily infected, further complicating the use of ethyl chloride spray. Fuadin is occasionally toxic and a careful check must be made on the kidneys and blood. In addition, the patient has to report daily for the injections. The need for a non-toxic helminthicide, taken orally and effective against the larvae of *Ancylostoma braziliense*, is self-evident.

Oliver-González et al. (3) reported the treatment with hetrazan of 23 patients infected with *Wuchereria bancrofti*.

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Fifteen months after therapy, 13 patients (56.5 per cent) had been free of infection. The remaining 10 patients had no detectable microfilarial counts but no evidence of a relapse. The dosage ranged from 0.5 to 2 mg. per kg. body weight, given orally three times daily. They noted that the patients receiving the larger doses had the best response. They concluded that hetrazan, when given in adequate dosage to patients infected with *Wuchereria bancrofti*, cleared the blood stream of microfilaria for periods of at least 15 months.

Since 28 June 1949, 21 cases of creeping eruption have been seen at the U. S. Naval Hospital, Jacksonville, Fla. The youngest patient was 18 months of age and the oldest, 49 years. There were 10 males and 11 females. The number of active larvae varied from 2 to an estimated 25. The most common site of infection was the foot, particularly around the toes, and these patients were often referred with a tentative diagnosis of epidermophytosis. The buttocks and genitals were often involved; the hands, back, and legs, rarely. All patients or parents could give a definite time of infection, usually immediately following a picnic, beach party, wading in ponds, playing in sandpiles, or working in the yard. The latent period from the initial penetration of the skin by the larvae until symptoms appeared was usually less than 48 hours and often in a few hours. Most patients thought they had been bitten by mosquitoes, sand fleas, or ants since small discrete papules were initially evident. In a few days the migrations of the larvae were plainly visible. The intense pruritus was usually worse at night. The patients slept fitfully, often clawing the offending areas viciously. Children cried out in their sleep and awoke sobbing and scratching. Patients have been known to mutilate their bodies with penknives and needles in a fruitless effort to rid themselves of the burning pruritus.

#### TREATMENT

Of the 21 patients with creeping eruption, 7 were transients who could not be seen regularly and were treated with ethyl chloride spray. Due to a temporary shortage of the drug one had combined therapy. Thirteen were treated with hetrazan (diethylcarbamazine) alone. These patients were weighed carefully and the dose computed on 2 mg. per kg. body weight three times daily before meals. Children and adults received the same relative dose. Initial roentgenograms of the chest were taken because Loefler's syndrome has been reported with creeping eruption (4) (5). Follow-up roentgenograms were taken in instances where there were significant complaints or a dry hacking cough. Only one case of Loefler's syndrome was noted. Complete blood counts and urinalyses were done twice weekly and each patient

was instructed to report any nausea, vomiting, cramps, diarrhea, or general malaise. Not a single untoward reaction was reported with the dose employed. Several facts are worthy of note. The pruritus usually became minimal in 48 to 72 hours. If the patient forgot to take the drug or was temporarily without it the pruritus usually returned. The number of active larvae, as measured by their activity, gradually decreased rather than all ceasing at the same time. The average time required to acquire clinical cure was about 3 weeks although one patient required only 8 days; another required 30 days, but after the first week there was little complaint. Perhaps a higher dosage would effect a more rapid cure. One patient was apparently well in 9 days but noted larval activity 1 week later. He was re-treated, employing the same dose, and a permanent cure was effected 17 days later. Since this patient was the only one with roentgenographic findings characteristic of Loeffler's syndrome the case will be presented in detail.

#### CASE REPORT

P. E. P., a 28 year old man, was referred with a tentative diagnosis of contact dermatitis. Three weeks previously he had weeded his garden for about 3 hours. The soil was sandy, warm and moist. That night he experienced pruritic papules like "ant bites" over the dorsum of the right hand. The next day a linear vesicular dermatitis was apparent and he consulted a physician who advised benadryl and moist boric acid compresses. The dermatitis continued in spite of numerous ointments and a course of penicillin.

On examination the right hand excluding the thumb, was swollen and stiff. The skin over the dorsum of the little finger was macerated and erythematous. Numerous wavy, vesicular linear lesions, some curled on themselves and some crossing others, were present on the back of the hand, in the palm, and circumventing the third, fourth, and fifth fingers. Right epitrochlear and axillary adenopathy were present. Hetrazan, 2 mg per Kg body weight three times daily before meals, and aluminum acetate (1:20) wet dressings were prescribed. The response was dramatic. In 9 days the skin was normal except for a small area of hyperpigmentation over the dorsum of the little finger. A 21 percent eosinophilia was reported. The admitting roentgenographic examination of the chest was interpreted as being compatible with allergic pneumonitis (Loeffler's syndrome). The roentgenographic findings of the chest 1 week later were negative.

The patient was discharged to duty but returned in 7 days with four demonstrably active larvae. He was again given hetrazan and the skin became clear in 17 days. He has remained asymptomatic.

#### RESULTS

Of the 13 patients with creeping eruption who were treated only with hetrazan, 9 (69 percent) were clinically cured. Two failed to return for their final check-up but since both were progressing satisfactorily when last seen it might be assumed that they were cured and saw no need to make an unnecessary trip to the hospital. However,

these two are included in the four failures. The accompanying table illustrates the important features of these 13 cases.

TABLE 1

Case	Age (years)	Sex	Weight (kilograms)	Roentgenogram of chest	Average eosinophilia (percent)	Number of days	Result
1.....	28	M	85	Area of pneumonitis on right side opposite seventh interspace	21	26	Cured
2.....	8	F.	24	Negative.....	2	24	Cured
3.....	5	M	18	Negative.....	3	30	Cured
4.....	5	M.	19 8	Negative.....	11	19	Cured
5.....	4	M.	16	Negative.....	1		Failed to return
6.....	22	F.	70 2	Negative.....	8	20	Failure
7.....	18	M	75	Negative.....	6	17	Failure
8.....	9	F	30	Negative.....	9	22	Cured
9.....	23	M.	60	Negative.....	6	20	Cured
10.....	14	F.	59	Negative.....	8	8	Cured
11.....	29	F.	59	Negative.....	7		Failed to return
12.....	11	M.	54 5	Negative.....	7	19	Cured
13.....	1.5	F.	10	Negative.....	2	9	Cured.

## SUMMARY AND CONCLUSIONS

1. Of 13 cases of creeping eruption treated with hetrazan there were only 2 known failures. Two failed to return for a final examination but were progressing satisfactorily when last seen.

2. Hetrazan is a safe, nontoxic, effective treatment of creeping eruption.

## REFERENCES

1. SHUFLEBEE, J. B.: Creeping eruption; report of case. *J. Cutan Dis* 23: 256-260, June 1905.
2. SMITH, D. C.: Treatment of creeping eruption with sodium antimony bisulfate (fuadin). *J. A. M. A.* 123: 694-695, Nov. 13, 1943.
3. OLIVER-GONZÁLEZ, J.; SANTIAGO-STEVENSON, D.; and MALONADO, J. F.: Treatment of filariasis bancrofti with hetrazan. *J. A. M. A.* 139: 308-309, Jan. 29, 1949.
4. WRIGHT, D. O., and GOLD, E. M.: Loeffler's syndrome associated with creeping eruption (cutaneous helminthiasis). *J. A. M. A.* 128: 1082-1083, Aug. 11, 1945.
5. HORTON, S. H.: Creeping eruption; report of case with Loeffler's syndrome. *U. S. Nav. M. Bull.* 49: 703-706, July-Aug 1949.





persists for a long time with milder measures. Do not increase the erythema and edema and denudation of an acute dermatitis by using strong agents. Anything that makes the dermatitis or itching worse is too strong for that particular patient's skin. If in doubt, get expert dermatologic help before irreparable changes occur.

(d) Prevention. Reduce the factors that support fungus growth such as: (a) careful and gentle daily washing and removal of dead skin, especially between the toes, with a bath towel; (b) liberal use of a dusting powder between the toes, in the groin, and in the axilla in the morning helps to reduce moisture; (c) low quarter shoes or ventilated shoes (in civilians) will help reduce the heat, moisture, and maceration.

Persons vary in their sensitivity to fungi and some have to be more particular than others in controlling the conditions for fungus growth. Occasionally a mild fungicidal ointment at night may be required by some patients. If a patient is active, ointments applied during the day increase the maceration and are poorly tolerated. Fungistatic foot powders (Army issue, or Desenex) are useful for daytime application.

C. Scabies. Although the management of scabies does not usually cause much difficulty, the disease serves to illustrate further the mechanisms by which dermatitis may be produced. Wartime studies are a basis for much of this information. The disease is caused by the *Sarcoptes* mite, which can live for only short periods outside the human skin and is acquired principally through contact with the skin of an infested person. When a person who has never had scabies is infested for the first time, the mites burrow into the epidermis, multiply there, and spread to many sites over the body. For 4 to 6 weeks the patient has no itching and no typical red papules, wheals, or vesicles. After this incubation period, the skin apparently becomes sensitized to the mite and then the body responds by an inflammatory reaction with vasodilation and pouring out of intercellular fluid, which produces the visible lesions of scabies and are accompanied by itching. If the patient gets warm, the peripheral blood vessels of the skin dilate; this increases the reaction in each lesion and causes intensification of the pruritus. This same mechanism explains why patients with other types of dermatitis also have increased itching when they get warm. The itching of scabies, therefore, is probably not related to movements of the mite, for the mites are just as active before the patient is sensitized and before the patient notices any pruritus.

If a patient who has had scabies and has been cured is reinfested, itching and typical inflammatory reactions appear shortly after the mites burrow into the epidermis because the epidermis apparently remains sensitized from the first infestation. The basic mechanism by which scabies lesions appear is analogous to fungus infections, in

that it is a type of contact dermatitis in which the allergen or irritant resides in the epidermis itself. The aim of treatment is to kill the self-perpetuating "antigen." It is apparent, however, that even though the mites are killed and a thorough bath is taken, some of the mite products may not be eliminated for several days. This partially explains the persistence of pruritic lesions for several days after adequate antiscabietic therapy. In addition, secondary infection and an irritative dermatitis may have been produced which in itself may persist after all mites are killed and removed.


The treatment of scabies has been simplified and improved by the introduction of new effective nonirritating scabieticides. The formulas for two of the best and safest are:

(a) Benzyl benzoate emulsion (commercially available and supplied as a 50 percent oily liquid), and water of equal amounts to make 100 percent.

(b) Benzyl benzoate (an oily liquid), 10 percent; DDT powder, 1 percent; "benzocaine" powder (local anesthetic and ovicide), 2 percent; "tween 80" (an emulsifier), 2 percent; and water, to make 100 percent.

The treatment of scabies always begins with a prolonged warm soap bath or shower to remove crusts, scabs, and thickened epithelium that might prevent the scabieticide from reaching the mites. The skin is then dried and one of these preparations is applied generously to all parts of the body from the chin down, paying particular attention to the genitals, anal area, hands, and other involved sites. The material is rubbed in well and allowed to dry. The same clothing may be worn. If the hands are washed during treatment, another application should be applied to that area. The next morning, the patient takes a shower bath, dons fresh clothing, and changes bedding. If adequately applied, one treatment is almost always effective, but in some patients it may be desirable to apply the medication twice and thus continue the treatment for 24 to 36 hours instead of the usual 12 hours. To prevent relapse, all suspected contacts must be treated simultaneously. If severe secondary pyogenic infection is present, intramuscular penicillin may be added to the above routines.

The second preparation is also the treatment of choice for pediculosis capitis and pubic lice. Children or infants with scabies are treated in the same way, but careful application of the material to face and scalp may also be necessary in those only a few months old. Following one adequate course of treatment no scabieticides should be reapplied for at least 10 days. If an irritative dermatitis and itching persist, basic shake lotion, or calamine liniment (N.F.) are prescribed. Remember, the causative mites are almost certainly destroyed by one treatment. After that, treat the resulting dermatitis as gently as any other dermatitis.



# Relationship of Bullous Staphylococcic Impetigo and Exfoliative Dermatitis of the Newborn

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A RECENT epidemic of bullous staphylococcic impetigo which developed in the newborn nursery of a naval hospital revealed the close association of impetigo and exfoliative dermatitis. Of 80 infants exposed in the nursery during a 4-week period, 20 developed a disease of the skin, 4 of whom presented manifestations resembling dermatitis exfoliativa infantum (Ritter's disease) (1). The remaining 16 infants showed at least 1 of 3 types of similar but less severe skin lesions: (a) vesicles coalescing and rupturing to leave large areas of exfoliation, (b) large discrete bullae, and (c) multiple tiny vesicles and pustules.

Under the title "Exfoliating Dermatitis of Nursing Infants," Ritter (1) in 1878, described an exfoliating disease of the skin which, at present, bears his name. The disorder usually begins as a red exfoliating patch on the lower portion of the face, although it may appear first on any part of the body. The initial lesion spreads rapidly until the entire surface of the body is red and exfoliating. In some instances, vesicles and bullae appear early. The mucous membranes of the mouth, nose, and conjunctiva may be involved. The skin beneath the exfoliating portion may present a moist or dry surface. Most often the surface is moist, weeping, and crusted. Early in the disease, light pressure will cause the superficial skin layer to be separated from the corium (Nikolsky's sign). The disease is said to occur between the second and fifth weeks of life and, in Ritter's time, a mortality of 50 percent was noted.

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## EPIDEMIOLOGY OF OUTBREAK

A survey of the epidemiological aspects of this outbreak in the nursery was of little value in determining whether any person, or whether a break in aseptic technique, was responsible for the epidemic. It was of interest, however, that cultures of the throats of all the staff and nursery personnel revealed that, of the 20 persons from whom cultures were taken, 9 (45 percent) were harboring an organism thought to be identical with that cultured from all the infected infants. This is in accord with a report by McFarlan (2) who found a similar high percentage of normal persons harboring pathologic forms of staphylococcus. Further information was obtained from the nursery records. It was noted that for several months prior to the outbreak there were numerous references to such diseases as diarrhea, skin eruptions, and cord infections. The overcrowded conditions in the nursery prevented proper isolation of these patients. These instances of infection, although seemingly minor in importance at the time, should have been a warning.

## DESCRIPTION OF OUTBREAK

On 12 October 1947 a newborn infant, H H., was readmitted to the hospital and isolated because of a severe skin eruption. Within 10 days a total of 20 infants born in this institution were found suffering with a similar skin disease. The epidemic proportions of the disease process were thus soon apparent.

Cultures from the throats of the 20 affected infants revealed non-hemolytic *Staphylococcus albus* predominating in 17. From the throats of 2 infants, Friedländer's bacillus and hemolytic streptococcus were cultured. In 1 infant the throat culture revealed gram-negative diplococci. Cultures of the skin, skin lesions, and bullae revealed non-hemolytic *Staph. albus* in pure growth from 18 and predominating in 2. Blood cultures taken from each infant showed no evidence of bacteremia.

## CASE REPORTS

The case reports of one infant with so-called Ritter's disease and one infant with bullous impetigo are presented:

*Case 1.*—K. M., a 12-day-old white boy appeared normal until the eighth day of life. On the eighth day, however, the mother washed the skin from the buttocks and penis. She immediately took the infant to a physician whose examination revealed that very slight pressure to the forehead and cheeks would separate the superficial layers of the skin from the deeper tissues, leaving open, weeping, raw areas. The infant was hospitalized under the care of one of the authors (J. O. R.).

On physical examination at admission the infant appeared in no acute distress despite the severity of his skin involvement. The skin showed a generalized eryth-

eminent especially noticeable around the mouth and eyes. There were a few tiny vesicles scattered over the chest and forehead, the eyelids were red and swollen. Slight pressure on almost any portion of the skin removed the superficial layers from the deeper tissues.

The infant's course while in the hospital was uneventful except for several loose, watery green stools. Cultures of the throat revealed the presence of Friedlander's bacillus and hemolytic streptococcus. On the fourth hospital day the infant was transferred to the U. S. Naval Hospital, Portsmouth, Va., to a ward specially equipped to accommodate the infants affected in this epidemic.

On admission to the naval hospital he presented a generalized redness and exfoliation of the skin. The scalp appeared to be involved in a severe seborrheic eczema but this skin, unlike that in eczema, could be peeled off in large sheets leaving in places dry new skin and in others, open, weeping areas. The skin over the rest of the body showed eczematous changes and was tough and leathery to the touch. The remainder of the examination was essentially normal. The child was afebrile and appeared alert.

The laboratory examinations showed a normal urinalysis, hemoglobin 11.5 gm. per 100 cc. blood, red blood cell count, 3.8 million per cu. mm., and white blood cell count, 16,000 per cu. mm., 67 percent of which were polymorphonuclear cells, 21 percent lymphocytes, 8 percent eosinophils, and 4 percent monocytes. Cultures of the skin and throat showed an almost pure growth of nonhemolytic *Staph. albus* and no evidence of Friedlander's bacillus or streptococci.

On the second hospital day, the parents appeared and were concerned about their development of lesions similar to those that had initially developed on their child. In the mother's left axilla were several bullous impetiginous lesions and on the father's forehead and around the angles of his mouth were several small, impetiginous lesions. Cultures from these lesions showed almost pure growth of nonhemolytic *Staph. albus*.

The infant's hospital course was essentially uneventful. He took his feedings well and showed no further diarrhea. He was discharged from the hospital on the seventh hospital day. The skin at that time was entirely normal and the child was considered to be in normal good health.

**Case 2**—W. S. J. was discharged from the nursery at the age of 5 days. On the seventh day of life the parents noted tiny pimples in the diaper region. During the following few days prior to admission this area grew progressively more inflamed and the pimples became larger.

The infant was admitted to this hospital on his fifteenth day of life and the admission physical examination showed a mile infant in no apparent distress and with no abnormalities except for the skin. There was a definite erythema around the lower portion of the face and neck and in the skin folds and creases. The skin over the lower portion of the abdomen was covered with numerous large bullae. The area surrounding these bullous lesions was a deep purplish red, the umbilicus was moist and weeping; there was a slight purulent secretion from the left eye.

The laboratory findings showed 4.9 million red blood cells per cu. mm., 15.5 gm. hemoglobin and 8,500 white blood cells per cu. mm., 48 percent of which were polymorphonuclear cells, 48 percent lymphocytes, 2 percent monocytes and 2 percent eosinophils. Cultures of the throat and skin revealed pure growths of nonhemolytic *Staph. albus*.

The hospital course was uneventful. The lesions healed rapidly and the infant was discharged on the sixth hospital day.

## DISCUSSION

In view of our findings of exfoliative dermatitis in its classical form in 4 of the 20 infants affected in this epidemic and because of its apparent contagiousness (case 1), we agree with a number of authors (10) (11) (12) (13) (14) (15) in suspecting that so-called Ritter's disease merely represents a severe reaction to a bacterial invader. A number of theories have been offered to explain the etiology of Ritter's disease. It has been considered a pathologic expression of the normal exfoliation of the newborn (3); a form of hereditary epidermolysis bullosa (4); a nutritional disturbance of the superficial layers of the skin (5); a temporary dysfunction of the endocrine system (6); a primary avitaminosis (8); and a fundamental deficiency of the skin and mucous membranes (7). Skinner (9) suggested that a diffuse peripheral vascular lesion was the cause.

All the infants in this outbreak were remarkable because very few systemic manifestations of a disease process were present despite the malignant nature of the skin lesions. The only clinical evidence of systemic disease in these babies on admission was a leukocytosis with an increase in the polymorphonuclear cells and, in one infant, a rectal temperature elevation to 102.6° F.

Therapy was maintained on as uniform a schedule as possible. One cubic centimeter of a solution of crystallin penicillin (5,000 units per cc.) was given intramuscularly every 3 hours until the skin lesions disappeared. In three infants from whom skin specimens for biopsy were obtained, local applications of penicillin ointment (500 units per dr.) were applied to the site. In infants with extreme exfoliation and weeping lesions, supportive whole blood transfusions were given.

Recovery in each infant was entirely uneventful. In those infants in whom the superficial layers of the skin were removed by the disease process, healing occurred with a thickening or eczematization of the skin. This thickening remained apparent in the more severely affected infants for periods as long as 2 weeks but gradually cleared, leaving soft skin. During recovery a number of infants showed an increase in the percentage of eosinophils. In one infant, the eosinophils, at one point, accounted for 28 percent of the white blood cells. However, this is a frequent finding in patients suffering with general dermatosis (14).

No infant in this epidemic required hospitalization for more than 2 weeks. We attributed the absence of deaths to the fact that the infecting agent was sensitive to penicillin and that we were able to provide adequate nursing and medical care.

## SUMMARY

An epidemic of contagious staphylococcic impetigo in the nursery of the newborn of a naval hospital resulted in the development of skin

lesions in 20 infants. Four of the twenty developed skin manifestations characteristic of Ritter's disease. The observations made during the epidemic show the close relationship between Ritter's disease and impetigo, making it appear that so-called Ritter's disease may represent a severe form of impetigo. The infecting agent in this epidemic appeared to be nonhemolytic *Staphylococcus albus*.

## REFERENCES

- 1 VON RITTERSHAIN, G. R. Die exfoliative dermatitis jungerer S nglinge. *Ztschr f Kinderh* 2: 3, 1978.
- 2 McFARLAN, A. M. Incidence of pathogenic staphylococci in nose. *Brit M J* 2: 939-941, Nov 3, 1938.
- 3 WINTERITZ, B. Ein Beitrag zur Kenntnis der Dermatitis Exfoliative Neonatorum (Ritter). *Arch Dermat & Syph* 44: 397, 1898.
- 4 KAPOSI, M. Path und Ther der Hautkrankheiten. 3d edition. 1887. p 372.
- 5 CASPARY, J. Ueber Dermatitis Exfoliativa Neonatorum. *Arch Dermat & Syph* 16: 122, 1884.
- 6 SANO, M. E. Skin disease of newborn infant; consideration of relationship between Leiner's and Ritter's disease, with case report. *J Pediat* 23: 280-289 Sept 1943.
- 7 WIDEMAN, A. Dermatitis exfoliativa neonatorum (Ritter's disease). *Am J Dis Child* 70: 329-330, Nov-Dec 1945.
- 8 SCHWARZMAN, J., DRAGUTSKY, D., and ROOK, G. Ritter's disease: report of case in which recovery occurred. *Am J Dis Child* 62: 352-357 Aug 1941.
- 9 SKINNER, E. F. Note on histology of dermatitis exfoliative neonatorum. *Arch Dermat & Syph* 22: 75 March 1910.
- 10 De SANCTIS, A. G., and De LORENZO, F. C. Exfoliative dermatitis (Ritter's disease) treated with sulfathiazole. *New York State J Med* 41: 1201-1202, July 1, 1941.
- 11 VAN VONNO, N. C. Case of Ritter's disease (dermatitis exfoliative neonatorum). *Nederl tijdschr v geneesk* 75: 1932-1937 Apr 11, 1941. abstr. *Am J Dis Child* 43: 217 1932.
- 12 WIRZ, A. Exfoliating dermatitis. *Cor-Bl f Schweiz Aerzte* 46: 1688 Dec 9, 1916.
- 13 SPERK, B. Observations on dermatitis exfoliative (Ritter). *J A M A* 62: 1764, 1914, abstr.
- 14 RYAN, N. W., and GOLDMAN, L. Treatment of Ritter's disease with sulfa pyridine, report of a case with recovery. *Am J Dis Child* 59: 1957-1962, May 1940.
- 15 ZAKON, S. J. Relationship of dermatitis exfoliative neonatorum Ritter and impetigo bullosa in adult. *Arch Dermat & Syph* 24: 830-834, Nov 1931.



# The Individual in Confinement

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THE individual in confinement is rarely considered as a definite personality but one of a group that has committed an offense and must be punished.

Confinement for a period of time is usually considered the type of punishment indicated for most military offenses and disciplinary barracks were established for such a purpose. The person sentenced to an institution for confinement loses his identity and becomes a prisoner with a number. He has "failed in the service" and, in the "eyes" of most people, "brought it all upon himself."

A more constructive attitude can be gained by considering the characteristics of the person in confinement and attempting to understand the reasons for his behavior, which deviated from the normal accepted standards of the group.

## METHOD OF STUDY

One hundred cases were taken at random from the files, carefully analyzed, and the data tabulated (table 1). These records were the results of examinations of men confined to the disciplinary barracks, San Pedro, Calif., during 1948. All these men had complete physical examinations, psychiatric examinations, and psychological studies. Initial interviews were available and later a social history was obtained from the home community. The largest amount of material was compiled during their initial 2-week quarantine period and before the man had an opportunity to discuss his affairs with other prisoners. This same method of study is followed in each man admitted to this institution. It is considered essential as a preventive measure and also helps with placement of the man in some definite occupational field. The educational department administers a battery of tests to each man in order to offer vocational guidance and to help him plan for the future.

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TABLE 1—*Characteristics of 100 unselected prisoners, U S Naval Disciplinary Barracks San Pedro Calif., 1948*

Home conditions		Type of offense—Continued	
Good	5	Disobedience of orders	1
Average	6	Sleep on watch	1
Marginal	55		
Broken	34		100
School (average grade claimed)	8.8		
		Average age (years)	23
Type of offense		Race	
Theft	11	White	87
Robbery	4	Negro	6
Desertion	44	Other	7
A. O. J.	23	Probation violators	19
Scandalous conduct	5	Marital status	
Assaulting another	2	Married	34
Striking an officer	2	Single	66
Selling Government property	4	Previous honorable discharge (per-	
Stealing Government property	2	cent)	39

## ABOUT THE INDIVIDUAL IN CONFINEMENT

Many of these men had been in orphanages, their homes disrupted either by the death of one parent or divorce of the parents. As a result of this they had no opportunity to establish any strong family ties. This condition prevented the development of an adequate super ego and is revealed later by his lack of fear of punishment for misbehavior. Such home conditions also affected the school adjustment and caused them to leave school at an early age. In many of these men the instability of the home was reflected in their conduct in school and resulted in their expulsion from school. In a small number the financial situation made it necessary for them to leave school at an early age to support the home. The range of ages extended from the oldest, 39, to the youngest, 17 years of age. The type of offenses committed reveals that 67 percent were absence offenses, i. e., 44 percent were desertion and 23 percent were absent over leave. Theft constituted only 11 percent of the offenses.

This brief summary gives a picture of a person from a very poor home who has had little security and never developed any strong family ties. He is 23 years of age and his offense was absence over leave (67 percent of cases). The majority of these men have evidence of difficulty in adjusting to their environments from childhood. The usual history is that he had difficulty in school and was expelled. Many of them have a juvenile record and a small percent were sent to industrial schools because of stealing or incorrigibility. Only a few give a history of any serious illness or periods of hospitalization prior to their enlistment in the service, so they may be considered physically healthy persons.

## REACTION TO CONFINEMENT

During a period of confinement, opportunity to study the individual more closely and observe his reactions to situations was considered of great value. Frequent interviews were possible with each man during his period of confinement; in addition, group therapy proved to be helpful both to the individual and also to the staff in understanding individual problems. The same emotional reactions to confinement were very clearly demonstrated in individual discussions and in group therapy. The majority of the men manifested a strong resentment toward their confinement and had a deep sense of rejection. The feeling that they failed in the service apparently activated feelings of inferiority that existed from childhood and caused them considerable anxiety. In many men the anxiety was so acute that hospitalization was necessary shortly after their arrival in the institution. All the men were under considerable tension because of their strong resentment and their feeling that they were being rejected by the service. There was always a strong desire for revenge and as a result very definite paranoid trends were common among the group. These men tended to project their difficulties upon others and showed little ability to accept much responsibility for their actions. They compared themselves with persons who commit civil offenses in an effort to minimize their own inability to adjust.

The majority of the men blamed their difficulties upon illnesses of members of their families or their wives and thus they justified their reasons for being absent over leave. It was noted particularly during the initial interviews that the men gave only one single reason for their offense, either illness of some member of their family, marital discord, or drinking (which occurred in 11 percent of this group). In subsequent interviews other factors were often revealed as having a very definite influence upon his behavior. These other factors, such as some unsatisfactory situation at home or inability to obtain satisfactory employment, were often the reason for enlistment. The man who thus came into the service to escape some unpleasant situation soon found that he could not adjust adequately to the demands of the naval service and began to project his difficulties upon others and to seek an escape. This was apparently the same pattern that was followed from early childhood and he had little understanding of what was really causing him difficulty. The individual's only method of adjustment was by projecting difficulties upon others and developing a hostile paranoid reaction in an effort to protect his feelings of inferiority.

The desire for some type of revenge was very striking in the group and is apparently common to all persons in confinement. Some of them managed this on a passive basis whereas others were openly

aggressive in their desires for revenge upon those who they believed were responsible for their confinement. In many instances these paranoidlike feelings were widespread and showed no channelization or direction but included anyone who frustrated them in the slightest way. During the period of confinement these trends had to be controlled rigidly to prevent additional difficulty. Thus the majority of prisoners had multiple psychosomatic symptoms.

### EMOTIONAL FACTORS

The striking characteristics of the prisoners were their lack of self-criticism and the inability to accept responsibility for their behavior. The man made an effort to protect himself from feelings of insecurity and inferiority by projecting his difficulties upon others. Few gained any insight into this reaction. Even in individual therapy it was difficult to develop an attitude of self-criticism, and if the man did gain some insight into his difficulties he was amazed to consider for the first time that he was at fault. The majority in this group showed very definite lack of identification with their parents or any strong parental substitute and as a result of this they were very easily influenced and dependent upon others. The group identification was very strong, and each prisoner was quite willing to fight the battles of his fellow prisoners, feeling that they were being persecuted and this was a means of getting revenge.

The majority of men in confinement were extremely sensitive about their position and became very emotional when treated in what they considered a derogatory manner by others. Each one appeared to be striving to protect his own ego against overwhelming odds and yet to conform to the demands of the group. As a result of this situation the man was caught between the rigid rules of the institution and demands of the group confined. His ego was further crushed by rigid disciplinary regulations on one side and demands of the prisoner code on the other side. To protect his ego he used any method possible to gain recognition and there were several ways in which this was attempted. One was by means of rebellion so that he could gain the recognition from other prisoners for his ability to thwart the authorities. There was also the rigid code that the man must adhere to, and that is, of never giving information about others or suffer being labeled as a "white rat." The majority of men followed the rules and attempted to gain recognition by obtaining other special privileges (wearing different shoes from the general population of prisoners or sitting in a special place in the auditorium when moving pictures were shown) as this satisfied their ego striving to some degree. Few realized the antagonism to authority was simply the pattern that was developed in the poor home situation and was the result of childhood traumas.

In those persons who had prolonged psychotherapy these patterns were easily revealed to them and in the majority of instances there was a definite alteration of their reactions after this time. Anxiety was one of the factors in all prisoners, and each developed his own method of managing his anxiety unless the pressure became too great. There were very few prisoners whose anxiety was not of such a degree that when regulations were rigidly enforced they developed more symptoms and found it difficult to control these symptoms. This indicated that their anxiety was greatly increased and beyond their control, and frequently panic states developed; during these periods the men abandoned all caution and care. However, during these periods of intense anxiety, in the majority of such instances, the men were either brought to sick bay or came of their own accord. Another period of intense anxiety occurred during the weeks prior to discharge from the institution; they feared something would obstruct or prevent their release at the time specified and they had great difficulty in controlling these fears. Frequently, just prior to his release, it was necessary to admit the man to sick bay for further treatment to help him control the symptoms associated with such a state of anxiety.

#### SEXUAL CONFLICTS

Sexual conflicts were prevalent in a large number of prisoners but were controlled satisfactorily. It was rare that sexual episodes were noted among the prisoners, although they were very conscious of such behavior. Apparently the verbalization of sexual conflicts, the hostility, and symptom formation was sufficient to control overt sexual behavior. Those men with known homosexual habits were usually segregated and later transferred to the Disciplinary Barracks at Portsmouth, N. H. There were many who had overt homosexual tendencies but controlled them well under supervision. With treatment these men had little or no difficulty, because they were able to control these habits satisfactorily while in confinement. States approaching panic reaction were frequently encountered in persons with sexual conflicts intensified by confinement.

#### TREATMENT

The treatment program at the disciplinary barracks has been difficult because of the large number of men needing individual therapy. Practically all the persons admitted had multiple emotional conflicts that had caused difficulties since early childhood, and their confinement was largely the result of following the same pattern of behavior. Each man hoped to escape confinement by some means and many had hope that a medical survey might be a means of escaping their period of confinement. There was also considerable resistance to treatment as

each one was reluctant to give up his pattern followed for many years. This was clouded by intense feelings of hostility toward authority. Group and individual therapy was used to the widest extent but in special cases other forms of treatment such as subshock insulin and narcoanalysis were used. It is believed that the various methods used achieved some success in the majority of the prisoners and at least made them conscious of their own inner conflicts to some degree. With the limited staff, extensive treatment of each man was impossible and only a small number were given individual therapy. Many instances can be cited where the person's aggressive hostility was impossible to control, until he gained some insight into the causes of his reactions. Afterward he made a very satisfactory adjustment to the institution.

At the present time there is no method of obtaining information about the person's adjustment after discharge to determine the value of the psychiatric program. Many of the prisoners showed a definite *change in attitude toward confinement after psychiatric treatment* but the "carry over" effects after release cannot be evaluated.

#### SUMMARY

An attempt has been made to give a composite picture of the average man sent to the disciplinary barracks, San Pedro, Calif., in order to afford a better understanding of the cause of his failure to adjust to the naval service. Whereas, the majority of prisoners (67 percent) were convicted of absence offenses, there were others convicted of more serious offenses (including murder, theft, and assault). Neither the seriousness of the offense nor the fact that a certain percent had a period of honorable service has proved to be of value in estimating the degree of emotional illness of these men.

All of these men had severe emotional difficulties when examined at this institution, and of the total population about 3 percent were definitely psychotic. In view of these facts the value of confinement seems questionable unless a very intensive program of psychiatric treatment was possible during this period. Confinement alone appeared to make the man unfit for an adjustment in society because it increased the hostile-aggressive pattern followed from childhood.

The goal of confinement should be to prepare the prisoner psychologically for an adjustment in society rather than increase his hatred for all authority.

#### BIBLIOGRAPHY

1. LINDER, R. M., and SELICER, R. V.: *Handbook of Correctional Psychology*. Philosophical Library, Inc., New York, N. Y., 1947.
2. SUTHERLAND, F. H.: *Principles of Criminology*. 3d edition. J. B. Lippincott Co., Philadelphia, Pa., 1929.

3. KELLNER, A. V : Juvenile delinquency. Federal Probation, Dec. 1948.
4. ROSE, M : Importance of understanding treatment needs of truants. Federal Probation, Dec. 1948.
5. HUNT, J. M : Personality and the Behavior Disorders. Vol. II. Ronald Press Co., New York, N. Y., 1939.
6. FREUD, S. : Problem of Anxiety. W. W. Norton & Co., New York, N. Y., 1939.
7. HENDRICK, I. : Facts and Theories of Psychoanalysis. 2d edition. A. A. Knopf, New York, N. Y., 1941.

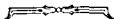


ADVENTURES AMONG VIRUSES: I. SOME PROPERTIES OF VIRUSES, by Christopher Howard Andrews, F. R. S. The New England Journal of Medicine 242: 162-166, Feb. 2, 1950.

Of particular interest are the cases of virus persistence in the recovered vertebrate host. Indeed, one school of thought maintains that the enduring immunity that is a feature of many virus diseases can be attributed to the equally enduring persistence of virus in the host. It is true that many viruses can persist a long time, but there is no evidence that this is so whenever this life-long resistance is found. Psittacosis in birds is a good example of a virus disease in which infection is probably contracted in the nest, is commonly inapparent, persists indefinitely, and may become apparent when some jolt upsets the host-parasite balance.

The best example from human medicine is probably herpes simplex. Dodd, Johnston, and Buddingh showed that aphthous stomatitis in children is often due to the herpes virus. It is thus that many children doubtless become infected. Afterward the virus seems to persist in the epidermal cells about the mouth as a latent infection.

We have noted, in considering viruses of many kinds, how often a virus latently infects its host until a jolt to the virus-cell equilibrium brings about visible disease. We have seen how transmissibility of a virus, ability to infect other cells, is a varying property that may or may not be present. We have found that virus infection may begin in utero and possibly be transmitted even in the germ plasma. Finally, viruses are capable of great feats in the way of variation and adaptation, and they can also cause cell proliferation. We have, therefore, no grounds for maintaining that viruses cannot cause cancer because viruses do not have the qualities necessary to act the part. We need not find it difficult to believe in viruses that are almost ubiquitous, normally cause no visible disease, are transmitted in the earliest days of life and only in certain circumstances sustain a jolt that causes them to give rise to new growths. Bittner's virus of mammary cancer in mice has all these properties. Perhaps it is straining my metaphor to speak of a jolt in this instance, for the hormonal influences that lead to induction of cancer may well operate by permitting selection of a mutant of the ordinary latent form of the virus to a form that is highly pathogenic but extremely labile.—*Abstract.*



# Nutrition in Public Health in Japan<sup>1</sup>

PAUL E. HOWE, *Colonel, M&C A U S.*<sup>2</sup>

THE nutritional situation in Japan from January 1946 to December 1947 was similar to that in the liberated and occupied countries of Europe. The resources of the country had been used to support the activities of the Army, and the food of the civilian population had been officially restricted from the beginning of the war to approximately the basal metabolic level and had become so short that scientists were trying to determine how much farther the ration could be lowered without curtailing the ability of the people to support the Army. The people were apprehensive as to what the food situation might be under the occupation. Under such conditions, it was difficult to evaluate the reports as to the nutritional situation. The Supreme Commander Allied Powers (SCAP) wisely took action to determine the actual state of the nutrition of the people through (a) review of autopsy reports of persons dying in public places, (b) obtaining reports from the Ministry of Welfare of deaths caused by malnutrition, and (c) institution of nutrition surveys.

Remedial steps included reduction of the number of concentration camps to the minimum, care for the indigent by the Japanese Government, and the impounding and orderly distribution of surplus Japanese Army and Navy food and clothing, holding part of these supplies for emergencies. The immediate responsibility for the determination of the nutritional status of the people was placed on the Chief of the Public Health and Welfare Section and clearance was required between the sections of General Headquarters SCAP concerned with food to assure coordinated action. A consultant in nutrition was provided in the Public Health and Welfare Section for immediate supervision of the nutrition surveys and analysis of Japan's nutritional problems. The consultant traveled to some of the major cities for a personal

<sup>1</sup> This article continues a series of articles on nutrition published in *The Bulletin of the U. S. Army Medical Department*, March, April, and May 1949.

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evaluation of the nutritional situation to obtain information from clinicians and Japanese health officials in order to determine where surveys should be conducted; he then organized the nutrition surveys.

The visible effects of under- or mal-nutrition take a long time to appear. The appearance of symptoms of nutritional deficiency in a community is evidence that either a particular food or food in general has been scarce or that proper care has not been given to the provision of an adequate diet. The only measure of inadequate diet prior to the appearance of symptoms is a review of the total food eaten daily. This involves a study of food habits and the availability of food. The medical phase of public nutrition is primarily diagnostic and advisory. Sound nutritional information forms the basis of decisions and advice. It is neither possible nor necessary to prescribe set food patterns since there are many ways to attain an adequate diet, although some food patterns are less likely to lead to difficulties than others. The quantity of food consumed is as important as the kinds of food, especially in judging simple diets in which large quantities of a particular food are eaten. Often it is possible to substitute one food for another; this is of importance in dealing with the poor.

The problems of the health officer in Military Government differ somewhat from those of other health officers. The latter works to improve the nutritional status of a community in order to prevent disease and to promote general health. The Military Government officer, on the other hand, often works in a community with a restricted food supply. The level set by higher authority is one that may merely prevent disease and unrest, or may permit reconstruction and production at restricted levels of food intake. Such low levels of nutrition are often outside the officer's previous experience. To make sound recommendations requires a careful analysis of the psychologic as well as the nutritional phases of the problem.

#### NUTRITION AND THE HEALTH OFFICER IN MILITARY GOVERNMENT

*General responsibilities.*—In view of the relationship of nutrition to the maintenance of health, and to diseases of endemic and epidemic character, the nutrition of the civilian population is of particular concern to the health officer in Military Government. His responsibility in the control and prevention of epidemic diseases and in the preservation of health directs his attention to nutritional deficiencies as an outstanding factor lowering the resistance of a population and predisposing to epidemics. Nutritional inadequacies, moreover, are likely to result in civil unrest and dissatisfaction prejudicial to the occupation. The medical officer acts in an advisory capacity to other officers in Military Government charged with the provision and distribution of food to civilians. The problems concern production, procurement,



distribution, and rationing of food, and indigenous food habits in relation to established nutritional allowances and rations. The health officer reviews the nutritional status of the civilian population and makes suitable recommendations to his commander and periodic reports to higher headquarters as directed.

The nutritional status of a population and the food available are assessed at various levels of reliability. The number of economic and psychologic factors involved in borderline cases require factual evidence and careful sifting of reports and rumors with regard to hunger, disease, and food supply in relation to normal conditions existing in the country and community and to basic nutritional requirements for sound long-range recommendations. Means of assessing the nutritional status of food intake include (a) observation of people on the street and of the foods available on the farms, in markets, and in stores; (b) analysis of the frequency and location of food thefts; (c) checks on such groups as infants, children, pregnant and nursing women, old people, patients in hospitals, and inmates of institutions; and (d) nutrition surveys.

Nutrition surveys include a survey of food consumption and physical examinations of the population and provide the best means of assessing the nutritional status of a population. Evidence of the nutritional status of the population indicates the types of food that need emphasis and the degree of emergency that exists in cases of general undernutrition. The kinds and amount of food consumed supply a basis for recommendation as to the kinds and amount of food required. Such data are required for action by the military authorities or the civilian population. Food consumption may be determined by (a) questioning persons as to the kinds and amount eaten in the last 3 meals and intermediate periods (this yields fairly good preliminary results when conducted by trained questioners), (b) having housewives keep records of the kinds and amount of food used in a given period; (c) placing observers in a home to weigh and record the kinds and amount of food used by the family or members of the family; (d) requiring that records be kept of the quantities of all food used in institutions and hospitals, and the number of persons actually eating the food; and (e) evaluating the result of consumption studies, made with tables of food composition. (All echelons concerned with the results should use the same tables or include a specific statement as to the tables used.)

The methods used in physical examinations may be simple or complex, but in general, the simple procedures are preferable. Symptoms and physical findings are rarely specific and diagnostic by themselves and should be supplemented by laboratory methods when feasible; however, symptoms and findings such as night blindness, typical skeletal changes associated with vitamin A and D

deficiencies, modifications of the skin and membranes of the mouth, and changes in nerve reaction and bradycardia in vitamin B complex deficiencies are reliable and diagnostic. Body weight in relation to standard height and weight for a given population is indicative of the extent of general undernutrition. Comparison of the incidence of symptoms from one survey to another and in relation to the usual rates together with consideration of the death rates and incidence of infectious diseases in the community are important in reaching a sound conclusion.

Prevention of dietary deficiency consists of the maintenance of normal nutrition in average persons by means of a natural diet, the components of which should be varied in order to insure qualitative adequacy. Health officers in Military Government should consider the availability and cost of foods and the dietary customs and habits of the people who are to consume them. Conclusions that dietary habits and customs exert an unfavorable influence on nutritional status should be made only after careful observation and consideration, since it has been shown that natural selection often results in adequate diets. Acceptable and adequate substitute food-stuffs should be available *before questionable native food practices are discontinued*, since as a rule food habits are deeply ingrained in the people. Not uncommonly, the deficiencies resulting from habit and custom are related to modern methods of processing and preservation. Thus, the use of highly milled and polished rice has produced a high incidence of beriberi in certain areas of the Orient, and in Japan has led to legislation regulating the milling of rice in order to preserve the antiberiberi factors in the grain.

Protection against nutritional inadequacy applies to particular groups of people who are especially susceptible to nutritional deficiency disease, such as infants, children, adolescents, pregnant and lactating women, the aged workers exposed to certain occupational hazards, and persons with diseases predisposing to nutritional deficiency. Circumstances may require the addition of special food supplements or chemical preparations to the diet of such groups. In general, natural foods and natural concentrates are to be preferred to chemical preparations.

The relief of dietary deficiency belongs to the realm of clinical medicine in all but the milder deficiency states that are amenable to simple dietary measures. *These mild deficiencies should be relieved through an adequate natural diet.* Severe deficiencies are specific medical problems to be treated medically as indicated, often with pure vitamins or chemical products. The basic principle of returning to a natural diet as soon as possible, however, applies even in florid cases, since such a diet prevents the recurrence of the deficiency and the appearance of other nutritional disorders.

Nutrition surveys in Japan were requested of the Japanese Government by a directive from SCAP\* which provided that an officer of the Military Government, preferably a medical officer, review the conduct of surveys, especially with regard to the uniformity of the physical examinations.

The surveys were conducted under the general supervision of the Ministry of Welfare of the Japanese Government. The chief of the sanitary bureau of the city or prefecture was responsible for their conduct. *The results of surveys were transmitted to the Ministry on completion.*

Previous experience indicated the following difficulties in the conduct of the physical examinations: (a) Occasionally the scales were inaccurate—necessitating checking; (b) the quantity of clothing permitted in taking body weights has varied—necessitating establishing a standard for correction; (c) suitable devices for measuring height were usually but not always available; (d) the knee jerk was not determined by a uniform technique, and (e) examinations for hyperkeratosis were often perfunctory and confined to the upper shoulder and back of the neck, whereas in doubtful cases it is desirable to observe the back of the upper arms and legs.

Information on food consumption was obtained by requiring the housewife to record the kinds and amounts of food used in the household each day for 3 days. A nutritionist took the forms to each of the houses assigned to her on the day previous to the first day of record. The morning of the second day of record, she went to the house and checked the entries of the previous day. Samples of quantities of food used were sometimes kept by the housewife for verification of the weight by the nutritionist when there were no scales in the home. Standard weights of original and cooked food for given volumes were worked out and were used by the nutritionist. Daily visits were made to each house and the final sheet was collected on the day following the last day of recording.

Data on the quantities of food used per capita in hospitals were assembled each month in hospitals in Tokyo and later extended to other hospitals especially mental and tuberculosis hospitals, in other parts of Japan. It was recommended that similar data be obtained in penal and correctional institutions and homes for children and the aged, as part of the accounting of the institution. This "nutritional accounting" permits a rough evaluation of the adequacy of the food purchased, produced, and fed to the people living in the institution or home, and is an index of the effectiveness of the administrative control of the institution. Such reports combined with a basis of

\* (SCAPIN 422) 11 December 1945 subject "Nutritional Surveys of Civilian Population" supplemented by Memorandum, dated 14 October 1946, subject "Information of General Application Pertaining to Directive Number SCAPIN 422."

rationing is an excellent basis for purchase and production of food when there is a farm attached to the institution. To facilitate review of the nutritive value of the food supplied, foods of similar kind and nutritive value or which are valuable for particular nutrients were classed together and the consumption per capita was calculated for the group. This reduced the number of items and permitted a ready nutritional review once the food pattern of the institution was known and evaluated.

*Rations for hospitals and institutions.*—Special allowances for the inmates of hospitals and institutions were recommended because of the difficulties such people have in obtaining additional food to supplement the inadequate ration. The recommendation included provision for nutritional accounting by institutions receiving extra food.

*School lunches.*—A proposal was discussed for the establishment of school lunches throughout Japan. The ideal school lunch not only

TABLE 1.—Food consumed per person per gram per day from nutrition surveys in Japan (Rice-year 1946-47)

	November 1946–August 1947			Indigenous total
	Urban	Rural	Total	
Grains:				
Rice	29.3	32.6	24.3	26.7
Wheat	5.5	4.1	3.2	2.8
Barley	21.3	63.1	31.3	43.1
Others	2.3	19.2	22.0	6.7
Total	58.4	119.0	120.8	174.1
Potatoes				
Sweet	17.0	18.1	16.5	
White	63.4	5.2	7.7	
Others	13.1	21.8	21.9	
Total	93.5	45.1	70.1	
Nuts	2	4	1	
Sunflower	9	5	6	
Oils	1.6	5	9	
Legumes:				
Soya	2.4	3.7	3.0	
Soya products <sup>1</sup>	19.1	28.3	32.0	
Other beans	6.3	6.1	6.2	13.4
Animal foods:				
Fish	57.9	22.3	40.2	
Meat, poultry	8.1	1.8	3.7	
Eggs	1.8	1.2	1.4	
Milk	1.1	2.3	2.1	
Total	68.9	28.0	47.4	
Leafy green and yellow vegetables	65.0	108.9	127.6	
Other fruits and vegetables				
Citrus and tomatoes	16.4	13.9	12.5	
Other fruits	7.4	7.5	7.5	
Other vegetables	181.6	152.2	165.8	
Total	205.4	173.7	184.8	
Seaweeds	7.1	2.1	7.6	
Processed vegetables				
Dried	3.7	3.4	3.5	
Pickled	17.6	63.9	40.3	
Flavors	21.4	16.3	18.9	

<sup>1</sup> All food aside from those with grains were indigenous.

<sup>2</sup> About 21 percent were dried beans.

<sup>3</sup> Nonindigenous food chiefly dried peas.

TABLE 2.—Percent showing deficiency symptoms

## URBAN (SCITIPS)

Period	Anemia	Hypochlorosis	Xerophthalmia	Chalk ovals	Glossitis	Losses of keratin	Chronic diarrhea	Body emaciation	Delayed menstruation	Toxic infection	No symptoms
May 1946	30.3	3.9	0.3	8.8	3.9	10.2	5.0	2.1	20.8	32.6	62.2
Aug. 1st 1946	9.0	0	1	8.4	2.1	10.0	2.8	1.3	19.1	23.6	69.4
November 1946	6.2	2.1	1	6.2	1.1	6.5	2.4	1.6	18.5	25.7	74.0
February 1947	4.6	2.2	1	6.0	1.8	6.8	1.5	1.0	14.0	31.4	77.7
May 1947	5.1	2.1	1	6.0	1.9	7.2	2.2	3.6	10.8	35.2	76.3
August 1947	6.0	1.1	1	5.2	1.0	10.0	3.1	1.7	10.1	42.6	71.5
November 1947	7.0	2.0	4	7.6	1.1	7.3	2.3	1.0	10.6	30.1	73.0

## Rural (27 prefectures)

Period	Anemia	Hypochlorosis	Xerophthalmia	Chalk ovals	Glossitis	Losses of keratin	Chronic diarrhea	Body emaciation	Delayed menstruation	Toxic infection	No symptoms
May 1946	2.8	3.0	0.4	12.8	2.0	6.1	1.6	0.9	11.0	20.9	71.1
August 1946	3.2	1.3	1	11.6	1.0	7.4	1.1	1.1	11.0	22.3	72.4
November 1946	2.7	2.3	1	13.2	1.4	6.0	1.2	0.6	11.7	23.4	72.1
February 1947	2.9	2.1	2	13.1	1.7	6.6	1.4	0.6	11.4	27.0	71.4
May 1947	2.6	1.8	2	11.3	2.0	6.5	1.2	2.0	9.0	29.3	75.1
August 1947	2.6	1.8	1	10.4	1.5	7.7	1.0	0.6	8.4	25.2	75.0
November 1947	1.3	4.1	1	11.1	1.8	7.5	1.1	2.8	18.1	24.5	72.0

TABLE 3.—Average weights of major groups of food consumed (grams)

## URBAN (SCITIPS)

Period	February 1946	May 1946	August 1946	November 1946	February 1947	May 1947	August 1947	November 1947	February 1948	May 1948
Grains, total (Rice)	352	297	308	303	407	390	371	338	416	437
Foodstuffs, total (Cassia pods)	297	297	308	290	429	270	361	358	290	322
Leafy greens and yellow vegetables	31	31	15	5.7	164	155	181	431	368	398
Other fruits and vegetables	125	125	207	110	65	71	7	316	327	353
Legumes, dry	130	130	24	24	237	307	318	101	317	374
Animal foods, total (Cust fish)	25.0	87.6	11.6	33.9	12.2	9.5	238	134	266	111
			46.6	82.4	76.2	88.6	11.0	10.6	14.4	15.3
			12.0	11.6	9.2	14.0	9.8	31.5	33.2	20.7

## RURAL (27 PREFECTURES)

	8.1	6.7	6.0	9.9	6.4	4.4	3.9	3.0	5.5
Grains, total	29.6	20.7	38.4	65.4	50.2	31.1	25.1	64.5	65.1
Dried and pickled vegetables	1,613	1,567	1,968	1,884	1,822	1,757	1,970	1,912	1,917
Potatoes, total	1,077	807	1,157	1,216	1,115	911	1,278	910	1,003
Protein, total	61.1	55.8	10.2	10.5	103.0	60.6	63.5	68.7	67.7
Fat (Animal protein)	18.6	10.2	16.3	14.1	19.5	12.4	16.1	16.9	20.3
Carbohydrate	13.7	12.7	12.7	12.2	13.4	11.2	12.9	14.8	12.0
	304	294	395	373	352	140	391	355	381

	453	430	467	415	401	449	418	452
Grains, total	213	298	381	346	267	299	331	337
Potatoes, total	214	520	274	212	203	403	218	141
Dried and pickled vegetables	194	417	207	134	11	311	155	82
Protein, total	210	132	76	85	134	167	77	93
Fat (Animal protein)	15.3	10.3	16.3	17.6	18.5	16.1	17.0	21.3
Carbohydrate	26.7	32.3	25.8	37.9	30.4	31.4	32.8	43.9
Protein, total	9.3	5.1	7.7	8.5	6.7	2.7	5.7	8.2
Fat (Animal protein)	1.4	2.0	1.6	2.5	0.9	2.2	2.2	3.4
Carbohydrate	53.2	75.6	91.7	72.0	60.7	55.9	91.2	60.1
Grains, total	1,922	2,376	2,165	2,032	2,041	2,062	2,018	2,001
Potatoes, total	455	218	160	225	194	352	423	510
Dried and pickled vegetables	59.9	62.5	59.0	57.5	59.8	60.1	60.0	60.6
Protein, total	6.0	7.0	5.7	8.1	6.0	7.2	7.0	9.6
Fat (Animal protein)	12.9	11.0	10.4	11.1	11.0	13.3	12.0	12.6
Carbohydrate	395	481	416	410	422	405	418	411

provides food for the children, but includes foods that will correct the deficiencies of the food pattern of that particular region or city. The medical officer in military government should take an interest in the program when started and report their opinion of the effectiveness of the program.<sup>5</sup>

*Monthly or bimonthly reports.*—The health officer was to supply information for a monthly or bimonthly report from the military government team to which he was attached. Information with regard to the nutritional status of the civil population for which the team was responsible was part of the regular health report. The fields to be reviewed and covered when applicable were as follows: (a) The food resources available, separated into indigenous and imported food; (b) the official ration scale for persons in various categories; (c) the quantities of rationed food available to persons in various categories, including those in excess of the authorized allowance; (d) the extent to which food obtained was purchased or received in whole or in part as a free issue, including food served in soup or central kitchens, and canteens of Red Cross, Welfare Agencies, mines, and factories; (e) the vitamin concentrates or preparations and mineral salts issued by private or State agencies and the categories of persons to whom available and the basis of issue; and (f) evidence with regard to the state of health of the population as indicated by the trend of changes in body weight and data when available and signs and symptoms of nutritional deficiencies in relation to categories of persons.<sup>6</sup>

The results of the surveys were invaluable. They formed the basis for recommendations with regard to the need for and amount of imported food. Data characteristic of the nutritional situation in Japan are shown in tables 1, 2, and 3. The most significant observation was an increase in the prevalence of loss of knee jerk and of bradycardia in May and August, which takes place each year. This change is ascribed to the deterioration of the rice with a loss of thiamine on storage. A food shortage in a country is best reflected in the heights and weights of adolescent boys and girls. A decrease in heights began in 1941 and became greater as the war progressed. However, the rationing program did not affect the average heights of rural children nor of boys or girls of 18 to 21 years of age who had been on restricted diets.<sup>7</sup>

<sup>5</sup> School lunches have been provided in Japan since December 1946.

<sup>6</sup> NOTE.—Since December 1947 the methods of nutrition surveys have been revised and the areas of the surveys have been expanded.

<sup>7</sup> Howe, P. E., Growth of adolescent child as affected by restricted nutrition. In press.



# ROTC Training in an Army General Hospital<sup>1</sup>

HOWARD H. ANGELL, *Major, MC, U. S. A.*

THE postwar Medical Department ROTC program has now been in effect for 3 years. As has been customary for many years, students enrolled in this program in colleges of medicine have been required as part of the program to attend a 6-week, summer-camp session. Until the summer of 1949 the camp had been held at the Medical Field Service School exclusively. During the camp period, students participated in a field medical type training. In the spring of 1949, the Department of the Army inaugurated an entirely new concept in the summer-camp training program. Accordingly, all students enrolled in the advanced course who were veterans of World War II were permitted to attend a summer-camp program in one of the Army's teaching general hospitals. This article describes the program as it was conducted in one of the participating hospitals.

The camp was conducted in two sessions, one running from 13 June to 23 July; the other, from 1 August to 10 September. Students were received and processed the first day of the camp period. They were housed in separate barracks provided for them and were issued enlisted type uniforms and necessary equipment. In some respects the position of the student was somewhat anomalous: administratively their status was that of cadets, and hence enlisted men, while at the same time they were regarded as officers in their clinical work. Insofar as possible an attempt was made to administer these students on an officer-equivalent status. They were invited to make use of the facilities of the Officers' Club and to eat in the Officers' Mess.

From the standpoint of student training, summer camp was designed almost entirely to be clinical in nature. Purely military and field medical subjects were confined to a period equivalent to one-sixth of the course. At this hospital, the first week of each of the camp periods was spent in the essentially military and field medical type instruction, leaving the remaining 5 weeks for purely clinical

<sup>1</sup> Percy Jones General Hospital, Battle Creek, Mich



training. Among the subjects presented in the first week were: (a) Safeguarding military information, (b) information and education, (c) medical records and reports, (d) leadership and courtesy, (e) military law, (f) hospital administration, (g) food service, and (h) organization of the Army and of the Medical Department.

### TECHNIQUES AND METHODS OF TRAINING

The experience at this hospital indicated that the before-mentioned subjects had been presented previously to these veteran students. It therefore was necessary to present them in the form of review or refresher-type training courses.

At the beginning of the second week and for the remainder of the camp period, the students worked exclusively on the wards and in the clinics of the hospital. They were divided into groups of four or five each, with one of the members of the group appointed as group leader. The group leader was responsible for group discipline and for non-professional supervision of the members of his group. Each group was assigned to a specific ward in such a way that they spent 2½ weeks on medicine and its subspecialties and 2½ weeks on surgery and its subspecialties.

Individual students functioned as clinical clerks. An attempt was made to give the student this clinical clerkship-type of training without conflicting with or detracting from similar instructions given them during their academic year in their colleges of medicine. Under the supervision of ward officers and chiefs of services students took histories, conducted physical examinations, and followed patients by preparing progress notes. Cases were discussed by the ward officers and chiefs of services and the clinical impressions of the students were crystallized and constructively criticized by the ward officers and chiefs of services.

Those students that were assigned to surgical services had the opportunity to follow a patient from the time he was admitted to the hospital, through the diagnostic work-up, the operation, and the post-operative care. In various types of surgical cases, students acted as operative assistants.

On the medical service they were given the opportunity to engage in diagnostic procedures, such as electrocardiography and gastroscopy. Some students were assigned to the out-patient clinic and to the clinics of the various specialties where they rendered invaluable assistance and where they could see first how ambulatory patients are treated.

The regular hospital formal education program was made a part of the required instruction of the students. Lectures on special subjects by civilian consultants and staff members, as well as clinical-

pathologic conferences, tumor board meetings, roentgenologic conferences, and other specialized features of the hospital educational program were participated in and observed by all students. No training in obstetrics and gynecology was given.

Dental students were afforded the opportunity of rotating through the various sections of the dental service of the hospital. In addition, a formal program of lectures and conferences on dental subjects was presented by staff members and dental consultants.

The results of the program have been excellent, both from the standpoint of the student and of the Medical Department. At this installation a questionnaire was given to each student at the end of the camp session for his anonymous comment as to his reaction to the camp program. An overwhelming majority of students expressed the opinion that the camp period was well worth the time spent. They were of the opinion that the clinical material which they had observed, plus the opportunities for actual participation in patient care under supervision were extremely valuable to them. The formal training program of the hospital also received favorable comment. An interesting aspect of the camp period was the amount of interest engendered by the program in both Army internships and Regular Army careers. Evidence gathered by both questionnaire and interview showed conclusively that the students had been profoundly impressed with the quality of Army medicine and the teaching value of the Army internship program. About 75 percent of the students attending camp at this installation indicated their intention of applying for Army internships. This is in sharp contrast to the percentage of students interested in applying for internships in former years and can only be attributed to the interest engendered by the summer-camp program. The reactions of the students were gratifying and they are of particular importance to the procurement program.



baccalaureate degree in appropriate academic training, above average efficiency, and is serving in a rank that will permit him to be assigned at a relatively high level of responsibility, stands the best chance for selection, provided he does not exceed the age limit set forth in regulations. Age and rank factors can be waived, however, within reasonable limits if circumstances warrant. Plans are drawn for the student's duty assignments following graduation, and his career pattern is adjusted accordingly. In making the selections the maximum number of applications are desired, and officers who do not receive favorable consideration are encouraged to reapply in subsequent years. Usually applications are not held for automatic reconsideration. Fresh comments both from applicants and commanders are desired as well as up-to-date transcripts of recent academic activities, if any.

After the cases are prepared by the Personnel Division they are presented to the Professional Education Committee for decision. This committee is composed of professional consultants to the Surgeon General and representatives of the Personnel Division. Other divisions are represented when the proceedings concern them. For instance the Chief, Medical Service Corps, sits on the committee when a member of his corps is being considered. The Chairman is the Chief, Education and Training Division. When all applicants have been considered the Personnel Division and the interested consultant both present recommendations on each case and a decision is reached. Acting on this decision, the Education and Training Division arranges for contracts with the schools to furnish the training and the Personnel Division issues the necessary orders, provides needed replacements for selected officers, and returns applications on which unfavorable action was taken. Funds in a limited amount are also available for courses of 12 weeks' duration or less. Usually these courses are not announced. Each application is considered when it is received and judged on its merits. The institution to give either the long or short courses can be selected by the applicant subject to concurrence by the committee.

Q. Is career management applicable in local assignment policies for administrative officers?

A. Yes. When a junior administrative officer goes to a duty assignment for a 3- or 4-year tour of duty, the commanding officer and the members of his personnel staff should plan duty assignments during this tour that will give the officer the broadest possible experience in the activities conducted at that installation. These assignments must be planned locally so as not to interfere with the activities of other officers and the mission of the command. A company-grade officer should rarely remain on the same assignment for the entire tour of

duty. Local career management will determine the success or failure of the program. Local training programs for officers can often supplement and, in some instances, obviate a certain amount of rotation. In any event, they should be an important part of local career management activities. A small number of junior administrative officers will be allowed to specialize but this group will include only those who qualify for positions that require a high degree of technical training in such fields as budget, atomic energy, legislation, and liaison.

When a senior administrative officer is assigned to an installation, it is usually intended that he fill a specific job that is in keeping with his primary MOS. In this case he should not be moved to another type of duty during his tour without concurrence of the Career Management Branch, Office of the Surgeon General.

Q. Should an administrative officer specialize in filling positions such as adjutant, mess officer, personnel officer, or supply officer?

A. No. Junior officers who specialize in such positions only hurt their future. As they advance in grade, they should enter broad fields of administrative specialization such as hospital administration, supply, and training, but they should seldom be assigned repeatedly to one type of position. Company-grade officers should also expect assignment to all types of units such as medical battalions; hospitals, both field and fixed; training centers; and Organized Reserve Corps units to give them a broad background in all Medical Department activities.

Q. Does constructive credit for a service school serve as a bar to attendance at that school?

A. No. Since the basis for credit was seldom the equivalent in training benefits to the material that could have been had by actual attendance, such attendance is encouraged.

Q. What is the authorized and actual strength of the Regular Army Medical Service Corps by grade?

A. This is shown in table 1.

TABLE 1.—*Grades of officers in Medical Service Corps*

Grade	Regular Army authorized strength	Regular Army actual strength		Reserve grade in which serving
		Permanent grade	Grade in which serving	
Colonel . . . . .	17	2	13	2
Lieutenant colonel . . . . .	116	50	66	57
Major . . . . .	158	113	140	247
Captain . . . . .	191	281	221	753
First lieutenant . . . . .	190	99	69	729
Second lieutenant . . . . .	200	15	9	299
Total . . . . .	832	588	588	2,127

Q How many vacancies for appointment in Regular Army Medical Service Corps exist in each of the four sections?

A. This is shown in table 2. The break-down is not established by law and is readily adjustable as estimated requirements change. Overstrengths in one section can be applied against vacancies in another until adjusted by attrition. Appointments now can be made only in the grade of second lieutenant (or first lieutenant with Ph. D. degree). Necessary information and qualifications for appointment are contained in SR 605-25-10, 21 December 1949.

TABLE 2—*Vacancies in Medical Service Corps by section*

Section	Authorized <sup>1</sup>	Actual	Vacancies
Pharmacy, supply and administration	510	499	11
Sanitary engineering	55	11	44
Optometry	17	1	16
Allied sciences	240	7	173
Total	822	518	214

Q How many Medical Service Corps officers will be sent to Army Service Schools during the calendar year 1950?

A. This is shown in table 3.

TABLE 3—*Estimated number of Medical Service Corps officers to be sent to service schools*

Armed Forces Staff College	1	St. Louis Medical Depot	
Command and General Staff College	3	Medical equipment maintenance	2
Medical Field Service School		Opticians	1
Advanced branch course	45	Radiologic defense	3
Basic branch course	10	Quartermaster School	5
Hospital administration	30	Army Information School	1
Associate advanced branch course	10		
Associate basic branch course	5	Total	118

<sup>1</sup> Given at the Army Chemical Center and elsewhere.

Q. How many Regular Army Medical Service Corps officers do you estimate will be in civilian institutions for training during calendar year 1950?

A. This is shown in table 4.

TABLE 4—*Estimated number of Regular Army Medical Service Corps officers to be sent to civilian institutions*

Hospital administration	1	Clinical psychology	8
Personnel management	1	Psychiatric social work	4
Business administration	2	Radiologic defense engineering	1
Parasitology	1	Pharmacology	4
Biochemistry	1	Radiobiology	1
Physical reconditioning	2	Training in industry	2
Bacteriology	2	Radiochemistry	1
Sanitary engineering	1		
Microbiology	1	Total	31

"OBSERVE ALWAYS THAT EVERYTHING IS THE RESULT OF A CHANGE, AND GET USED TO THINKING THAT THERE IS NOTHING NATURE LOVES SO WELL AS TO CHANGE EXISTING FORMS TO MAKE NEW ONES LIKE THEM."—*Marcus Aurelius Antoninus*

## EDITORIAL

### Resistance and Dependence of Bacteria to Antibiotics

The observation that certain strains of bacteria may become not only resistant to streptomycin, but also dependent upon the drug for growth was reported by Miller and Bohnhoff (1) (2) (3) (4) of the University of Chicago in 1947. This startling phenomenon has captivated the interest of scientists and physicians because of its practical and scientific interest. Of particular interest has been the continued investigation of the problem by Dr. Miller and his associates under the Office of Naval Research that has supported this research since 1946.

In the first report, Miller and Bohnhoff (1) state: "In an attempt to explain the rapidity with which meningococci develop a very high degree of streptomycin resistance during two or three subcultivations on media containing increasing concentrations of the drug, certain observations were made." Normal meningococcus colonies developed on media containing 10 to 20 micrograms of streptomycin per milliliter, but were absent on media having concentrations of 40 micrograms per milliliter. On higher concentrations of the drug, two unusual types of meningococcus colonies developed. The type designated as "A" variant appeared to be an ordinary streptomycin-resistant strain, but the type "B" variant is the one that made history.

In culture, "B" variants are small and pearl-gray when the medium contains from 60 to 100 micrograms of streptomycin per milliliter. On higher concentrations, the colonies are larger and have a yellowish tinge resembling "A" variant. This indicates that the concentration of the drug has a direct effect upon the cell physiology. The action is reversible, depending upon the concentration of the drug in the medium. These variants require streptomycin for growth in vitro and the number of colonies developing from equivalent inocula are always greatest when the concentration of drug in the medium is between 100 and 400 micrograms per milliliter.

This variant is not virulent for mice, but when mice are inoculated with the "avirulent" strain and "treated" with streptomycin (500 to 5,000 micrograms) they develop fatal meningococcal sepsis. Meningococci were recovered from heart blood cultures of the dead mice with

regularity when the cultures were made on streptomycin-containing media. Duplicate cultures plated on streptomycin-free media were sterile.

The investigators conclude, after thorough study, that this streptomycin-dependent strain is a current mutation. Reversion to "normal" or non-streptomycin-dependent type is so rare as to represent the exception that proves the rule.

Subsequent observations (5) (6) have yielded considerable information on the problem of resistance and dependence.

Rabbits and mice were treated with streptomycin. Cultures were made from their upper respiratory and intestinal tracts. During the second week of treatment, streptomycin-dependent bacteria belonging to species normally inhabiting the respective areas were recovered.

Throat smears from patients under treatment with streptomycin (receiving more than 1 gram of the drug daily) were examined for drug-resistant strains (7). During the first 13 days of treatment 95 percent of the patients were found to have streptomycin-resistant bacteria belonging to the normal flora of the human throat. It was reported that streptomycin-dependent strains were also recovered, but details are not given.

From these two series of tests, it is to be concluded that streptomycin-dependent bacteria actually occur in nature.

It is curious that in the most exacting streptomycin-dependent cultures, streptomycin is not utilized by the growth of the organisms (8).

Extension of studies to other micro-organisms has revealed that resistant and dependent variants occur in cultures of *Staphylococci*, *Bacillus proteus*, *Escherichia coli*, *Aerobacter aerogenes*, and *Salmonella*.

Studies currently under way are designed to determine how common resistance and dependency may be to other antibiotics. Two strains of meningococci have been found to "grow better" in the presence of penicillin. They "require" penicillin, however, only in the absence of certain growth-stimulating factors, such as whole blood in the media or high carbon dioxide concentration in the atmosphere.

Strains of *Escherichia coli* have been isolated that are resistant to penicillin, chloromycetin, and bacitracin, and to combinations of these drugs with streptomycin and themselves.

The importance of these observations is difficult to evaluate. Perhaps it is not surprising that such mutants occur in nature. Proof that they do, leads to some interesting speculations regarding the future of therapeutics and even epidemiology (9). The fact that antibiotic therapy, especially with penicillin and streptomycin, has given and continues to produce satisfactory results indicates that the phenomenon must not be too common or of too great significance.

This does not mean to infer that the clinician should fail to realize that such mutations do occur and may give rise to unpleasant results. The significance may be more far-reaching than can be visualized at present.—*Roger D. Reid*, Ph. D., Office of Naval Research, Washington, D. C.

## REFERENCES

1. MILLER, C. P., and BOHNHOFF, M.: Development of streptomycin-resistant variants of meningococcus. *Science* 105: 620-621, June 13, 1947.
2. MILLER, C. P., and BOHNHOFF, M.: Two streptomycin-resistant variants of meningococcus. *J. Bact* 54: 467-481, Oct 1947.
3. MILLER, C. P.: Development of bacterial resistance to antibiotics. *J. A. M. A.* 135: 749-751, Nov 22, 1947.
4. MILLER, C. P.: Some observations on development of resistance to streptomycin. *Tr. A. Am. Physicians* 60: 187-191, 1947.
5. MILLER, C. P., and BOHNHOFF, M.: Studies on action of penicillin; further observations on development of penicillin resistance by meningococcus in vitro. *J. Infect. Dis.* 81: 147-156, Sept-Oct. 1947.
6. MILLER, C. P., and BOHNHOFF, M.: Studies on action of penicillin; development of penicillin resistance by meningococcus in vivo. *J. Infect. Dis.* 83: 256-261, 1948.
7. MILLER, C. P., and BOHNHOFF, M.: Effect of streptomycin therapy on bacterial flora of throat. *Am. J. Med.* 6: 417-423, 1949.
8. MILLER, C. P.; BOHNHOFF, M.; and WILSON, J. S.: Failure to demonstrate utilization of streptomycin by streptomycin-dependent bacteria. In press.
9. MILLER, C. P.: Occurrence of streptomycin-resistant and dependent bacteria in throats of patients treated with streptomycin. *Tr. A. Am. Physician* 61: 335, 1948.





## BOOK REVIEWS AND BOOKS RECEIVED

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Bureau of Medicine and Surgery, Navy Department,  
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(For review)

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**EXPERIMENTAL SURGERY** including Surgical Physiology by J Markowitz M B E, M B (Tor) Ph D M S in Exp Surg (Minn) Associate Professor of Physiology University of Toronto, Formerly Assistant in Division of Experimental Surgery and Pathology Mayo Foundation Rochester Minn 2d edition 546 pages illustrated. The Williams & Wilkins Co Baltimore Md publishers, 1949 Price \$7

The author emphasizes that our knowledge of the physiologic activity of the various organs is largely based on experimental surgery performed on animals and further that many of the remarkable advances made in surgery and a great deal of the knowledge concerning the function of the glands of internal secretion are the direct results of this kind of surgery

This book contains a wealth of information relating to surgical physiology and experimental surgical procedures and technique covering practically every organ in the body, and also includes blood vessel surgery and surgery of the nervous system

The free style and discursive and coordinated presentation makes this book extremely interesting reading It is recommended for the intern and resident in surgery as well as for the surgeon and internist, they will find in it many practical facts of great clinical value—Capt J L Schwartz, (MC) U S A

**MUSCLES TESTING AND FUNCTION** by Henry O Kendall and Florence P Kendall Physical Therapy Department Children's Hospital School, Baltimore Md with a foreword by George L Bennett, M D Emeritus Adjunct Professor of Orthopedic Surgery and Robert W Johnson, M D, Adjunct Professor of Orthopedic Surgery, Johns Hopkins Medical School Baltimore, Md 274 pages with 162 illustrations The Williams & Wilkins Co Baltimore, Md publishers 1949 Price \$7.50

This book describes the procedures in testing, grading, and recording muscle strength The functional significance of muscle weakness and contracture is discussed in detail The records obtained from these tests provide a basis upon which the physician can prescribe muscle reeducation and upon which he can rely for pertinent information if it is necessary to plan reconstruction orthopedic surgery.

As a background for this book, muscle testing was performed on several thousand patients, both paralytic and nonparalytic, by the authors during 25 years

experience in physical therapy. In addition, for the purpose of research, tests and postural examinations were done on approximately 1,000 normal persons.

The first chapter presents the general procedures and fundamental principles in manual muscle testing and grading. Definitions of the terms used are included.

Chapter 2 illustrates four types of charts used in recording muscle examinations: diagnostic charts for nerve lesions, cranial nerve chart, poliomyelitis charts, and body mechanics chart. The diagnostic charts for the nerve are new and extremely valuable, and have been designed especially for use in lesions of the spinal nerves.

The remaining chapters consist of specific test procedures. Photographs and anatomical drawings are included with the tests to show the muscle, the direction of movement, and to indicate the place and direction of the examiner's pressure. The accompanying text gives detailed information on the test.

The appendix lists muscles grouped according to joint action and gives their origins and insertions.

Physical therapists will find this book a valuable aid in teaching and a useful reference.—*Lt. R. Moller, (NC) U. S. N.*

**THE PATHOLOGY OF NUTRITIONAL DISEASE, Physiological and Morphological Changes Which Result From Deficiencies of the Essential Elements, Amino Acids, Vitamins, and Fatty Acids.** by Richard H. Follis, Jr., M. D., Associate Professor of Pathology, Duke University School of Medicine, Durham, N. C. 291 pages, illustrated. Charles C Thomas, Springfield, Ill., publishers, 1948. Price \$6.75.

The reader of this treatise on the pathology of nutritional disease will find a complete discussion of the currently available information which deals with the physiological and morphological changes occurring naturally or produced experimentally, which accompany deficiencies of one or more of the forty-odd nutrients now known to be essential. Among the nutritional deficiencies discussed are scurvy, the anemia of iron deficiency, rickets, beriberi, pellagra, and colloid goiter.

Especially significant is the chapter on choline, which is an important constituent of the phospholipid lecithin. The role played by choline in cancer of the liver has been omitted; however, the relationship between choline and fatty metamorphosis is well presented and more recent developments are adequately discussed.

This excellent textbook is to be recommended to students of pathology and biochemistry, as well as workers in nutrition and other fields.

—*Lieutenant Commander K. P. Knudtson (MC) U. S. N.*

**NUTRITION AND PHYSICAL FITNESS**, by L. Jean Bogert, Ph. D. Formerly Instructor in the Department of Medicine, University of Chicago, Instructor in Experimental Medicine, Yale Medical School, and Lecturer in Chemistry, Connecticut Training School for Nurses, New Haven, Professor of Food Economics and Nutrition, Kansas State Agricultural College, Manhattan; Research Chemist Obstetrical Department, Henry Ford Hospital, Detroit. 5th edition. 610 pages, 35 tables and 96 figures. W. B. Saunders Co., Philadelphia, Pa., publishers, 1949. Price \$1.50.

This is the fifth edition of a text on nutrition which made its first appearance in 1931. The book is intended for those interested in home economics. The author assumes that the reader has no previous knowledge of physiology, chemistry, or nutrition. The aim of the book is to present the "particular facts which anyone needs to know in order to build a sound body and maintain a high degree of health and vigor."

The book is divided into five parts, namely: Foods, Body Needs, Body Processes, Meal Planning, and Diet for Special Conditions.

In covering this material in a small text, the author necessarily had to limit the material to the essentials and present those which she considered the con-

THE THERAPY THROUGH INTERVIEW, by Stanley G. LAW, M. D., *Minnesota Psychiatric Institute*. Foreword by Eric Kent Clarke, M. D., *Minnesota Psychiatric Institute, Minneapolis, Minn.* 265 pages. McGraw Hill Book Co., Inc., New York, N. Y., publishers, 1948. Price \$4.50.

This would be a very amusing book if it were written for that purpose. But since it is apparently intended as a serious book on therapy it is far from entertaining. It is true that the author states that it is not intended to create psychiatrists from general practitioners and that fault may be found with its oversimplification but he seems to lose sight of these facts after the first few pages. The naive reader who looks for clear-cut cases in actual practice will be sadly disappointed by the use of fictional cases in which the therapeutic situation is presented in question and answer form. These fictional cases create an unrealistic impression. In the opinion of the reviewer, the author has missed the type of case in which his intended audience, i. e., the general practitioner, is most likely to be interested. He discusses, for example, the therapy of peptic ulcer, the psychopath, and sexual perversions that more experienced psychiatrists might approach with misgivings but does not mention the handling of anxiety, fatigue, or the somatic manifestations of depressions which are a frequent source of complexity to the general practitioner.

The insistence of the author on the distinction between psychiatry and medicine should be clarified. It would seem that attempts to divorce psychiatry from the rest of the practice of medicine should be deprecated rather than encouraged. Psychiatry is only one branch of the practice of medicine and psychotherapy is only a specialized form of general therapeutics.

Although this book can hardly be recommended for the general practitioner who may be misled by its oversimplification it should prove entertaining to the psychiatrically oriented reader—*Commander J. R. Caranagh (MC) U. S. N.*

#### BOOKS RECEIVED

Receipt of the following book is acknowledged. As far as practicable, it will be reviewed at a later date.

MODERN FOOT THERAPY by Reuben H. Gross, M. C., Pod. D., *Dean and Chairman, Department of Podiatry, the First Institute of Podiatry, Long Island University, New York* with the collaboration of 19. Edited by Maurice J. Leoni, M. D., *President, and Director of Instruction, the First Institute of Podiatry, Long Island University*. Modern Foot Therapy Publishing Co., New York, N. Y., publishers, 1948. Price \$9.50.





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# Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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*Captain, Medical Service Corps,  
United States Air Force*

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DEPARTMENT OF THE NAVY  
BUREAU OF MEDICINE AND SURGERY  
WASHINGTON 25 D. C.

IN REPLY REFER TO

MEMO Personnel of the Medical Services, the United States  
Armed Forces

The April, 1950 issue of the U S Armed Forces Medical Journal reported the first step in achieving uniform classification, nomenclature and definitions of medical treatment facilities in the Armed Forces. That directive, promulgated by the Secretary of Defense on 27 January 1950, provided for uniform terms and definitions for bed capacity and bed spaces of fixed medical treatment facilities.

This standardization program was further advanced on 27 April 1950 with the issuance of two additional directives. The first provided a classification of and definitions for the fixed treatment facilities, i.e., dispensaries, infirmaries and hospitals. The second specified standard terms and definitions for bed capacity and bed spaces in non-fixed medical installations, such as mobile surgical hospitals, dispensaries operated as "organic" parts of tactical units, sick bays aboard ship, etc.

This program, developed by a Task Force of medical officers of the three services, is a significant part of the broad program of the military medical services, for it provides the framework on which interservice cooperation can be greatly strengthened and medical care facilities used to maximum advantage.

*Richard L. Melling*

Richard L. Melling, M.D.  
Director of Medical Services



# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published monthly by the Department of Defense*

F. W. FARRAR, *Captain (MC) U S N*, Editor in Chief  
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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY THE DIRECTOR OF THE BUREAU OF THE BUDGET, OCTOBER 19, 1949

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## Tumors of the Testes

### Five-year Follow-up Study

HUGH V. O'CONNELL, *Commander (MC) U S N*<sup>1</sup>  
CHARLES F. GENSCHICKTER, *Commander (MC) U S N* R.<sup>2</sup>

**A**LTHOUGH malignant tumors of the testicle are relatively rare, these neoplasms pose a particularly serious problem to military medicine. They occur in the third and fourth decades of life during the period of maximum productivity; the incidence is at its peak in the late twenties. Among Army personnel the incidence was found to be about 1 in 10,000; we found a similar incidence among Navy personnel.

#### HISTOGENESIS

Because the variety of histologic types of testicular tumors indicates that germinal tissue or gonocytic cells provide the origin for these new growths, one can theorize that the developmental potentialities of this tissue corresponds to the pathway of differentiation followed by the fertilized sex cell. The tissue of origin is totipotent and is capable of developing along lines similar to those found in the earliest phases of differentiation in the fertilized ovum or zygote. As shown in figure 1, the fertilized ovum pursues three separate lines of development. The earliest to be completed is trophoblastic differentiation which

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<sup>2</sup>Professor of Pathology, Georgetown University School of Medicine, Washington, D. C.; Consultant in Pathology, U S Naval Medical School, National Naval Medical Center, Bethesda, Md.

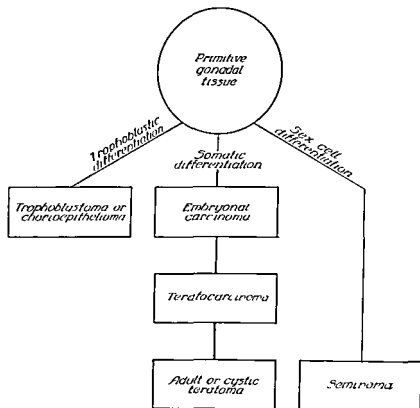


Figure 1—Theory of histogenesis of testicular tumors

forms placental tissue. Trophoblastic differentiation is represented among testicular tumors by chorioepithelioma or trophoblastomas. The second line of differentiation is concerned with embryogenesis and consists of the elaboration of the three germ layers. This is represented among testicular tumors by embryonal carcinoma, teratocarcinoma, and adult teratomas. The third line of development is concerned with the formation of reproductive tissue for subsequent generations and for the perpetuation of gonocytic tissue and is represented among testicular tumors by the seminomas.

#### HISTOPATHOLOGY

Following the lead of Ewing (1) in 1911 the trend in pathology was to disregard the histologic subclassification of malignant neoplasms of the testicle and to group them as malignant embryomas or teratomas, chiefly because an admixture of cell types could be demonstrated in a given case. In 1931, however, Ferguson et al. (2), studying the hormonal output of the urine in patients with testicular tumor, re-emphasized the desirability of subdividing these malignant growths.

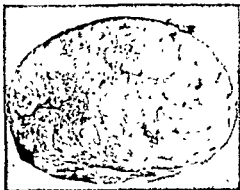


Figure 2.—Gross specimen of testicular seminoma. The cut surface of the tumor is granular and resembles somewhat the normal testis.

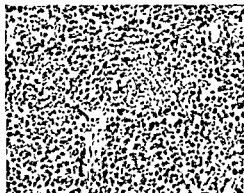


Figure 3.—Low-power photomicrograph of seminoma. The cellular components stand out individually and are embedded in lymphoid stroma.  $\times 100$ .

There is now a general agreement that the behavior and prognosis differ for teratomas, seminomas, and embryonal carcinomas—the most common types of testicular malignancy.

Seminoma is usually a slow-growing testicular mass. The history of swelling of the testicle may date back as long as 5 years; the average is 14.5 months. Grossly it is a granular, fleshy, yellow mass resembling the neighboring testicular tissue (fig. 2). Microscopically it is composed of rather uniform rounded to polyhedral cells occurring in large sheets. The cells have a distinct border, a centrally placed vesicular nucleus, and usually a distinct nucleolus. The cytoplasm is clear, taking a faintly eosinophilic stain with hematoxylin and eosin. In many instances a lymphocytic infiltrate is scattered throughout the tumor areas (figs. 3, 4, and 5).

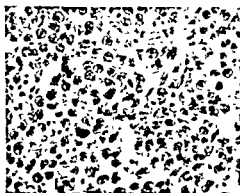


Figure 4.—Medium-power photomicrograph of seminoma. The nuclei and cytoplasm are of moderate size with an occasional large nucleus.  $\times 200$ .

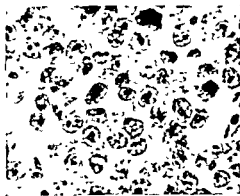


Figure 5.—High-power photomicrograph of seminoma. The nuclear pattern resembles that seen in embryonal carcinoma (fig. 12). The cytoplasm is granular and has indefinite borders. There is no attempt at alveolar formation.  $\times 400$ .



Adult teratoma and teratocarcinoma are solid or cystic testicular tumors which at times may seem to contain fluid on palpation depending upon the size of the cystic areas (fig. 6). In our cases, the history of a swelling of the testicle dated back 4 1/2 to 5 months. The adult type neoplasm grossly is well-circumscribed with a definite capsule separating the neoplasms from the surrounding testicular tissue. Microscopically, they are made up of a variety of structures with adult epithelium, cartilage, and smooth muscle predominating (figs 7 and



Figure 6.—Gross specimen of cystic teratoma of testis. The cystic components of the tumor bulge from its cut surface. The white fibrous structure of the neoplasm is clearly demarcated.

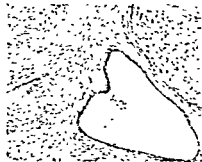


Figure 7—Adult testicular teratoma showing the dense fibrous stroma and a cyst lined by low columnar epithelium.  $\times 50$ .



Figure 8—Adult testicular teratoma showing the characteristic primitive fibromuscular stroma, islands of hyaline cartilage, and cysts lined with ciliated epithelium.  $\times 100$ .

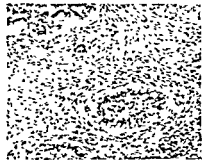


Figure 9—Testicular teratocarcinoma. This pleomorphic tumor contains islands of squamous epithelium and mucinous glands embedded in cellular fibrous stroma.  $\times 100$ .

8). Occasionally neurogenic tissue, osseous and various glandular components may be encountered. In general, the adult teratomas present histologic features in one or more areas that resemble those found in teratocarcinoma. The teratocarcinoma grossly resembles the

adult type but, in addition, areas of necrosis and hemorrhage are usually seen. Microscopically, all the elements present in the adult teratoma may be present but the individual elements, particularly the epithelium, take on malignant characteristics (figs. 9 and 10). Areas of chorionic tissue and embryonal carcinoma may be a conspicuous feature. In the final analysis the subclassification of teratomas into adult

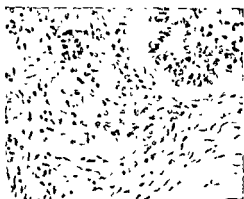


Figure 10.—Medium-power photomicrograph of the teratocarcinoma shown in figure 9.  $\times 200$ .



Figure 11.—Testicular embryonal carcinoma. The tumor is forming alveolar spaces surrounded by cells of varying shapes and sizes, containing irregular hyperchromatic nuclei.  $\times 100$ .

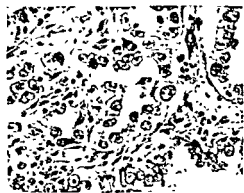


Figure 12.—High-power photomicrograph of embryonal carcinoma shown in figure 11. The alveolar pattern is clearly shown.  $\times 400$ .

and carcinomatous forms is of doubtful value. In our opinion both groups are malignant, the degree of malignancy varying with the amount of chorionic and embryonic tissue present. The embryonic tissue usually takes the form of embryonal carcinoma or neuroepithelioma.

Embryonal carcinoma forms a solid, rapidly growing mass which may be complicated by hemorrhage and tenderness. In our cases the duration of symptoms prior to examination was approximately 7 months. Grossly this carcinoma is a soft, necrotic, or hemorrhagic tumor mass ill-defined from the surrounding tissue. Microscopically it is composed of large epithelial cells occurring in a variety of cellular and acinar patterns. Occasionally the cells may be of uniform size and appearance, but more frequently there is considerable pleomorphism. The cells are larger than the cell making up the seminoma and vary in appearance from cuboidal to polyhedral. The nuclei are large and hyperchromatic (figs. 11 and 12). In this type,

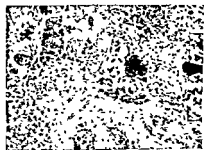


Figure 13.—Testicular chorioepithelioma or trophoblastoma. Characteristic islands of syncytial cells adjacent to vascular spaces. Sheets of cytotrophoblasts are also present.  $\times 100$

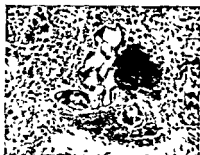


Figure 14.—Testicular chorioepithelioma. Same as figure 13.  $\times 300$

large bizarre cells representing the remnants of trophoblastic tissue are frequently encountered.

Chorioepithelioma of the testicle in pure form is rare, and signs of metastases associated with a positive Aschheim-Zondek test may precede the discovery of the primary mass. The surgical specimen shows soft, hemorrhagic, ill-defined neoplastic masses occupying a small portion of the testis. Microscopically the picture is characteristic (figs. 13 and 14). Two cell types are usually present, the large irregular hyperchromatic syncytiotrophoblast and the more regular, oval or cuboidal cytotrophoblast. In most areas there is no cell pattern but in some instances there are attempts at formation of typical chorionic villi. Hemorrhage is a prominent microscopic feature.

The mortality rate from these neoplasms has always been considered to be extremely high, however, no adequate studies of a large series of cases have been reported prior to the last war. In 1946 Friedman and Moore (3) reported 922 cases of testicular tumors observed for a period up to 1 year. During that period the mortality rates for this group were 27.5 percent for embryonal carcinoma, 17 percent for teratocarcinoma, 15 percent for teratoma, and 2.5 percent for seminoma. In 1947 Gordon-Taylor and Wyndham (4) reported 636 cases of testicular tumors; 38 percent of the patients were dead within 1 year and 55.5 percent within 5 years. The death rate in individual types of testicular tumors was not given, nor were the details of the follow-up data on which their conclusions were based. Lloyd Lewis (5) in 1948 reported that 24 percent of 169 patients with all types of testicular tumors treated between May 1942 and July 1946 by radical orchiectomy were dead at the end of approximately a year and a half.

Recently Sauer and Burke (6) reported that the over-all cure rate in their series, based upon a review of 202 cases of testicular tumor admitted over a 25-year period (1 January 1922 to 31 December 1946)

was 47.5 percent. The 5-year cure rate was 48.9 percent in 143 patients admitted prior to 31 December 1941. The cure rates for the various types were as follows: adult teratoma, 80.0 percent; seminoma, 59.6 percent; teratocarcinoma, 44.4 percent; and embryonal carcinoma, 22.5 percent.

#### CLASSIFICATION

This study is based upon 229 cases of testicular tumors, 216 of which fall into the classification of either seminoma, teratoma, or embryonal carcinoma. Of the 216 cases; 162 had been observed a minimum of 5 years or until death (table 1); 12 cases of miscellaneous tumors had been observed a comparable length of time. Only those cases in which microscopic study permitted classification of pathologic type and in which there was adequate follow-up data have been included. We found that the percentage distribution for the various types is comparable to that of Friedman and Moore (3) who studied a much larger group and that seminoma, teratoma, and embryonal carcinoma occurred with about equal frequency among 229 cases (fig. 15).

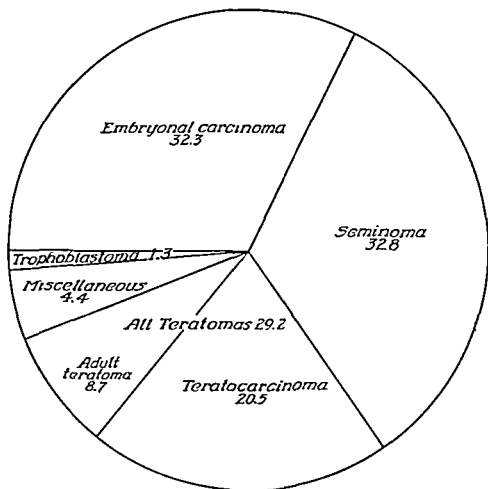


Figure 15.—Percentage distribution of testicular tumors.

TABLE 1—*Follow-up in 216 cases of tumor of testes*

Total number of tumors	Time followed in each case	Seminoma			Teratoma			Embryonal carcinoma		
		Number followed	Total number dead	Mortality	Number followed	Total number dead	Mortality	Number followed	Total number dead	Mortality
				Percent			Percent			Percent
216	6 months	75	6	8.0	67	4	5.9	74	23	31.1
214	1 year	74	11	14.9	67	14	20.9	73	36	49.3
213	2 years	73	19	26.0	67	29	43.3	73	31	69.9
206	3 years	69	21	30.4	63	31	49.2	71	35	77.5
182	4 years	61	21	34.4	55	34	61.8	67	56	83.6
162	5 years	52	21	40.4	45	34	75.6	65	56	86.2
149	6 years	46	22	47.8	42	33	83.3	61	56	91.8

The testicular tumors forming the basis of this study were classified histologically as follows:

Gonocytic series.

1. Seminoma
  - a. Typical.
  - b. With lymphoid tissue
2. Adult teratoma.
  - a. Typical cystic
  - b. With mesenchymal tissue predominating
3. Teratocarcinoma.
  - a. Teratoma with neuroblastic tissue predominating.
  - b. Teratoma with embryonal carcinoma predominating.
  - c. Teratoma with chorioepithelioma.
4. Embryonal carcinoma
  - a. Typical or pure type.
  - b. Embryonal carcinoma with seminoma
  - c. Embryonal carcinoma with chorionic tissue.
5. Chorioepithelioma or trophoblastoma.

Nongonocytic series:

1. Androblastoma (derived from Sertoli cells)
2. Interstitial cell tumor.
3. Lymphangioma or adenomatoid tumor of epididymis.

AGE DISTRIBUTION

The origin of testicular tumors is related to the maturation of testicular function. Gonadal development is at its maximum from the onset of puberty at about 13 or 14 years of age to the end of adolescence at about 16 or 17 years of age. Sexual maturity appears between the ages of 18 and 25. The highest incidence of testicular tumors occurs after sexual maturity during early adulthood, ages 26 to 35, rather than during adolescence.

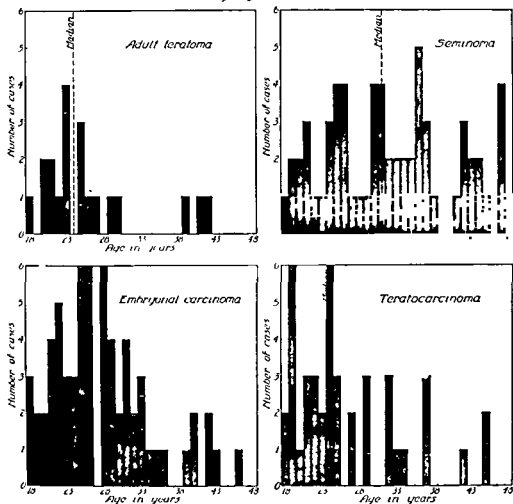
*Distribution of Testicular Tumors  
by Age at Onset*

Figure 16.—Median age groups.

In our series a study of the age distribution for the four types (table 2) showed that seminoma occurred comparatively much later than the other three types (fig. 16).

The age distribution shows the median to occur as follows: (a) seminoma, 31 years; (b) teratoma and teratocarcinoma, 24 years each; and (c) embryonal carcinoma, 26 years.

There is a difference of 7 years between the median age of seminoma and of the teratomas. This closely approximates the findings of Friedman and Moore who found a 5-year difference between the mean age for seminoma and teratocarcinoma. Embryonal carcinoma occurred somewhat later—about 2 years—than the teratomas. In our series the incidences were not corrected for the population distributions of the various age groups. In addition to Navy personnel some of the

cases were Veterans' Administration patients and some were civilians and the total population represented by these cases is not known. The median rather than the arithmetic mean was used owing to a limited number of extreme values which would distort the true nature of the age distribution.

TABLE 2—Age distribution in 189 cases

Age	Seminoma	Adult teratoma	Teratocarcinoma	Embryonal carcinoma	Age	Seminoma	Adult teratoma	Teratocarcinoma	Embryonal carcinoma
18	1	1	2	3	35	2	0	0	1
19	2	0	6	2	36	5	0	0	1
20	1	1	2	2	37	3	0	3	6
21	3	2	3	4	38	1	0	0	0
22	1	1	3	5	39	0	1	0	1
23	1	4	2	3	40	0	0	0	2
24	3	0	6	3	41	1	1	0	0
25	4	3	3	6	42	3	1	1	2
26	4	1	0	6	43	2	0	0	1
27	1	1	2	0	44	2	0	0	0
28	1	0	0	6	45	1	0	2	0
29	1	1	3	4	46	0	0	0	1
30	4	1	0	2	47	4	0	0	0
31	4	0	0	4	48	0	0	0	0
32	2	0	3	2					
33	2	0	1	1	Total	62	19	43	65
34	2	0	1	1					

### CLINICAL FEATURES

The clinical symptoms of testicular tumors are indefinite. A painless swelling of the testicle which enlarges gradually over months or years is the rule. The tumor affects the body of the testicle rather than the epididymis. Pain is associated only with trauma or hemorrhage. Symptoms of longer duration occur in the more slowly growing tumors, such as the seminomas. In 169 cases of our series the duration of symptoms prior to operation was given. In cases of seminoma it was 14.4 months; in embryonal carcinoma it was 6.9 months; and in teratoma and teratocarcinoma, it was 4.8 and 4.6 months respectively.

Cryptorchism was not an important feature in our series. Patients with undescended testicle are not accepted for naval service. However, cryptorchism was present in three cases of seminoma; but these were cases in civilian persons included in our study.

Bio-assay for gonadotropic hormones was helpful for diagnosis in only an occasional case, which was either a frank chorioepithelioma or where chorionic tissue was contained in tumors having the pathologic features of teratocarcinoma or embryonal carcinoma.

### TREATMENT

The treatment in these cases has been standardized in the past 20 years in naval hospitals, and consists of ligation of the cord at the

internal inguinal ring and excision of its distal portion along with the testicle. This is followed by external irradiation therapy through multiple ports by the divided dose technic, using 250 kv. A total of between 8 and 10 thousand roentgen units is given to the node-bearing areas—the right and left inguinal regions, and the hypogastric and preaortic group up to and including the region at the bifurcation of the aorta. The details of the operation were available in every case and in no case was radical orchiectomy performed (removal of the

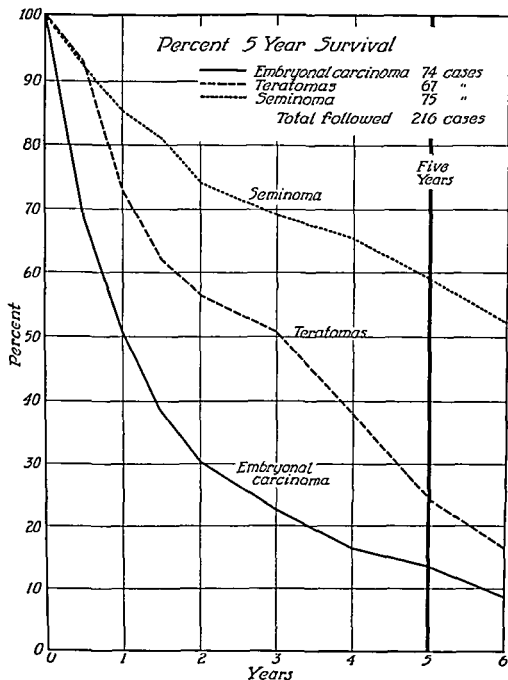


FIGURE 17



testes, the entire spermatic cord, and the retroperitoneal lymph chain from the inguinal ring to the renal pedicle). However, in two cases bilateral orchiectomies had been performed. Less adequate data were available on the technique of irradiation. However, in 80 percent of the records postoperative irradiation was in accordance with that previously noted.

### END RESULTS

The 5-year survivals in seminoma are approximately 60 percent, in teratomas, 24 percent; and in embryonal carcinoma, only 14 percent. The over-all 5-year survival rate is 31.7 percent. The mortality rates are greatest in the first and second years after operation. Of the 216 cases, 148 have been followed a minimum of 6 years; they are presented graphically to show that the general mortality trend continues beyond the "five-year" survival period (fig. 17).

The number of cases of pure chorioepitheliomas, 3, and nongonocytic tumors, 10, is too small for critical statistical analysis.

### DISCUSSION

Prior to recent years it was the consensus that seminomas constituted about two-thirds of all testicular tumors and that about 45 to 50 percent of patients with this condition survived 5 years or longer. The teratomatous tumors were considered to make up one-third of the total of the testicular new growths, and had a 5-year survival rate of about one-half that of seminoma. The reason for this misinformation was the inclusion of the embryonal carcinomas in the seminoma group. This distinction is sometimes made with difficulty and is an important one from the standpoint of prognosis. Friedman and Moore emphasized the importance of distinguishing between these two types of testicular tumors and our survival rates re-emphasize this point. Seminoma has a 5-year survival rate of 60 percent which is more than four times the 14 percent for embryonal carcinoma. Not only do the patients survive 5 years or longer but "permanent" cures are by no means rare and we have patients who had seminoma surviving 11, 12, 15, 17, 18, 20, and 21 years. An interesting case report in this group is the following: In 1929, at the age of 21, the patient had a unilateral orchiectomy for seminoma. In 1935 a seminoma appeared in the remaining testis for which a simple orchiectomy was also performed. He is living and well 20 years following the first surgery. Some writers believe that in contrast to seminoma, cures among embryonal carcinoma are exceedingly rare unless radical surgery is performed. Our statistics do not bear this out. There are records of patients with embryonal carcinoma who survived 6, 7, 8, and 11 years and of 5 patients who survived over 5 years; in these the treatment consisted

of unilateral orchiectomy and postoperative roentgen irradiation with 250 kv. In cystic teratoma and teratocarcinoma the survival rates lie between those of seminoma and embryonal carcinoma. Cures were recorded for both types of teratoma, and two patients with teratocarcinoma surviving 12 and 26 years and several with cystic teratomas living 10 to 11 years. Patients with trophoblastoma or chorioepithelioma rarely survive 5 years. There is one exception—a patient 23 years of age at time of operation who is living and well 6 years after treatment.

### SUMMARY

The significant pathological features of tumors of the testes are as follows: (a) Seminoma has a uniform type of cell without particular arrangement in lymphoid stroma. (b) Teratoma shows islands of cartilage, and epithelial proliferation of either benign or of malignant character and may also show cyst formation. When malignant neuroepithelium, chorionic tissue, or cells resembling embryonal carcinoma are present the tumor can be classified as teratocarcinoma. When cysts lined by mature epithelium are present it falls into the classification of adult or cystic teratoma. From a practical standpoint it is probably not necessary to differentiate between these two. Both types are malignant although cystic teratoma has a slightly better prognosis. However, in our experience, if multiple sections are taken, most cases of cystic or adult teratoma will be reclassified as teratocarcinoma. (c) Embryonal carcinoma can be classified on the basis of large neoplastic epithelial cells in crescent or pseudo-acinar arrangement.

A tabulated summary of the features of testicular tumors is presented in table 3.

TABLE 3

Pathologic type	Total number of cases	Percent of all types	Median age	Average duration of symptoms	5-year survival
			Years	Months	Percent
Seminoma.....	75	32.8	31	4.4	59.6
Teratoma.....	67	29.2	21	4.7	21.4
Embryonal carcinoma.....	74	32.3	26	6.0	13.8

Seminoma, teratoma, and embryonal carcinoma occur with about equal frequency in any large series.

The prognosis in both adult and carcinomatous varieties of teratoma is about the same.

Rare types of testicular tumors compose slightly over 5 percent of the total.

The 5-year survival rate of seminoma is 59.6 percent, and is twice the survival rate of 24.4 percent for teratomas and approximately four times the survival rate of 13.8 percent for embryonal carcinoma.

The over-all 5-year survival rate in testicular tumors is 31.7 percent.

Comparison of the results in this series with those in the literature show that unilateral orchiectomy followed by postoperative irradiation with 250 kv. is the treatment of choice; the survival rates are not enhanced by more radical surgery or more intensive irradiation.

There is a direct correlation between duration of symptoms and the degree of malignancy: especially in the case of the seminoma as compared with the other types.

#### REFERENCES

1. EWING J. Teratoma testis and its derivatives. *Surg. Gynec. & Obst.* 12: 230-261 1911.
2. FERGUSON R. S.; DOWNES, H. R. ELLIS, E. and NICHOLSON, M. E. Preliminary note on new method of differentiating the testicular tumors by biological means. *Am. J. Cancer* 15: 837-843, Apr. 1931.
3. FRIEDMAN N. B., and MOORE, R. A. Tumors of testis, report on 922 cases. *Mil. Surgeon* 99: 573-593 Nov. 1946.
4. GORDON-TAYLOR G., and WYNDHAM, N. R. On malignant tumors of testicle. *Brit. J. Surg.* 35: 6-17, 1947.
5. LEWIS L. G. Testis tumors, report on 270 cases. *J. Urol.* 59: 763-772, Apr. 1948.
6. SACER, H. R. and BURKE, E. M. Prognosis of testicular tumors. *J. Urol.* 62: 63-74 July 1949.
7. FERRIS, D. O. Pathology of tumors of testis: correlation with excretion of hormone in urine. *Proc. Staff Meet. Mayo Clin.* 16: 615-621, Sept. 24, 1941.
8. GOLDFIN A., and ASH J. E. Adenomatoid tumors of genital tract. *Am. J. Path.* 21: 63-79, Jan. 1945.
9. THOMPSON G. J. Tumors of spermatic cord, epididymis and testicular tunics, review of literature and report of 41 additional cases. *Surg., Gynec. & Obst.* 62: 712-728, Apr. 1936.
10. WARREN S., and OLSHAUSEN, K. W. Interstitial cell growths of testicle. *Am. J. Path.* 19: 307-331 Mar. 1943.
11. FOOT, N. C. Testicular tumors. *New York State J. Med.* 49: 284-286, Feb. 1, 1949.



# Torsion of the Spermatic Cord

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**T**ORSION of the spermatic cord, commonly but incorrectly considered as torsion of the testis, is not rare. The recent admission to this hospital of three undiagnosed, and consequently neglected, cases has emphasized the necessity of increased awareness of this condition by all medical officers. Early diagnosis is important. The dispensary surgeon must be especially cognizant of the condition since he is in a position to diagnose this abnormality which is easily corrected if treated early. A delay of only a few hours in proper treatment means the difference between a necrotic, atrophic testis and the retention of a viable, functioning organ. Two of these cases are presented as illustrations of erroneous diagnoses. The third, with the same pathologic findings, treated conservatively elsewhere for 5 weeks is not described in detail.

## CASE REPORTS

*Case 1.*—A 28-year-old man was admitted 20 days following an acute onset of pain in his left testis which occurred when he crossed his legs. He had received sulfadiazine and penicillin with slow regression in the extreme swelling of the left scrotal contents. On admission, the testis was about five times the normal size, was hard, and was suggestive of a tumor. Neglected torsion was



Figure 1.—Case 1. Torsion of left spermatic cord. A. Testis. B. Site of torsion. C. Tunica vaginalis and cord.

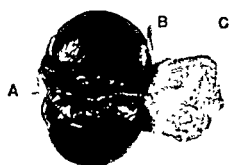


Figure 2.—Hemorrhagic infarction of testis. A. Testis. B. Site of torsion. C. Tunica vaginalis and cord.

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considered because of a history of at least three similar episodes of acute testicular pain, each of which terminated spontaneously after a short time. Surgical exploration demonstrated a 180° clockwise twist in the spermatic cord with infarction of the testis which required orchiectomy (figs 1 and 2). The underlying bell-clapperlike deformity on the opposite side was corrected.

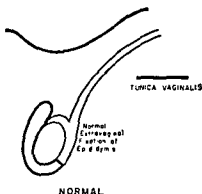
**Case 2**—An 18-year-old man was admitted to this hospital 4 days after waking suddenly with a severe pain in his left testis. There was immediate swelling which subsided only slightly under treatment with bed rest, penicillin, and sulfonamides. Examination revealed an enlarged, firm testis and scrotal edema. Thickening of the spermatic cord immediately above the scrotum was minimal. Prostatic secretions showed 15 to 20 leukocytes per cubic millimeter. Surgical exploration demonstrated a torsion of the spermatic cord with infarction of the testis which required removal. The opposite testicle was treated as in the preceding case.

### INCIDENCE

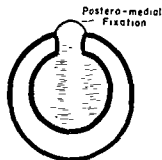
Undoubtedly the actual occurrence of this condition far exceeds the reported incidence. Ewert and Hoffman (1) collected 489 cases since the first formal report of this entity in 1840; they quote Wolf as having diagnosed the condition in a 68-year-old man. In the past 2 years the authors have observed three cases in infants ranging from 2 weeks to 16 months of age. Either side may be affected; in 24 of 350 cases collected by Ormond (2) torsion of the spermatic cord had occurred on both sides.

### PATHOLOGY

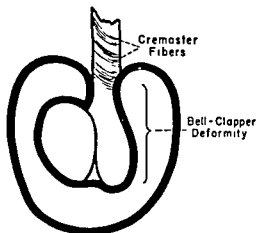
Torsion of the spermatic cord never occurs in the normal testis, for in the normal scrotum it is impossible to rotate the testis to any great degree. In the usual type of torsion of the spermatic cord an abnormality, either developmental or acquired, exists. There are two



**Figure 3**—Normal tunicular investment of the testis (after Muschat (3)). The tunica vaginalis covers the testicle and anterior part of the epididymis.

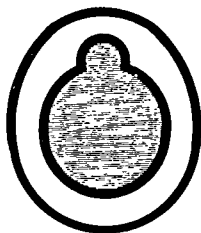


**Figure 4**—Cross section of normal tunicular investment (after Muschat (3)). Note the extravaginal epididymis.



## TORSION CASE

Figure 5.—Abnormality of tunical investment in torsion (after Muschat (3)). The low extension of the cremaster in high investment of the cord which results in torsion is illustrated.



## TORSION CASE

Figure 6.—Cross section of abnormal tunical investment in torsion (after Muschat (3)). The testis and epididymis are freely movable in the vaginal sac, making rotation possible.

types: (a) extravaginal (rare) often associated with trauma, and usually associated with incarcerated hernia or as a result of direct trauma in cryptorchidism; and (b) intravaginal (more common) amenable to surgical corrections when diagnosed early, and almost always associated with a scrotal developmental anomaly. Figures 3 and 4 demonstrate the normal tunical investments of the testis. The posteromedial aspect of the epididymis normally lies outside the tunica vaginalis. Figures 5 and 6 show the commonly encountered abnormality that results in a free-lying testis and epididymis within the parietal tunica vaginalis.

The names "dangling testis," "floating testis," "intratunicary pedicle," and "bell-clapper deformity" have been applied to this deformity. An additional feature demonstrated by Muschat (3) is high investment of the cord by the tunica vaginalis with downward extension of the cremaster muscle. Its contraction is the second etiologic factor in the production of torsion. Torsions of the left testis are predominately clockwise while those of the right are counterclockwise. In some instances the epididymis and testis are joined by a mesentery sufficiently long to allow rotation and strangulation of its blood supply (4). Once torsion is established there are two possible terminations if prompt surgical treatment is not given: (a) spontaneous detorsion which occurs often enough to provide a suggestive point in diagnosis; and (b) hemorrhagic infarction resulting either in necrosis or fibrosis of the testis. Spontaneous detorsion is illustrated by the following case.

*Case 3.*—A 20-year-old man was admitted complaining of severe pain in the left testis and groin and nausea of about 1 hour's duration. There had been two similar transient episodes in the preceding 2 days. The testis was acutely tender and drawn up against the pubis. En route to the ward, the pain spontaneously subsided, and local findings the following morning were limited to moderate tenderness and increased tension of the affected testis. Both testes were unusually mobile. There was a history of at least one prior similar episode on the other side. A diagnosis of spontaneous detorsion of the left testis was made. On surgical exploration a typical bell-clapperlike deformity was demonstrated. Bilateral fixation was accomplished by excising the parietal tunica vaginalis and suturing the lower pole of the epididymis in its normal posteromedian position.

### SYMPTOMS

With the onset of torsion, the chief symptom is acute severe pain in the testis or groin. Typically, the onset is sudden, following strain or slight and inconsequential trauma. The onset of pain has occurred during sleep. The severity of the pain depends on the completeness of the twisting and it may disappear as a result of spontaneous detorsion. This occurs with such frequency that a history of preceding similar attacks terminating spontaneously may be considered suggestive of torsion of the spermatic cord. (See cases 1 and 3.) Nausea, vomiting, and sometimes shock may be present. Usually, there is no temperature elevation and an important point in differential diagnosis is the absence of leukocytosis early in the course. Normal urine, prostate, and seminal vesicles in the presence of the preceding symptoms is indicative of torsion, but there is nothing to prevent torsion from occurring in a man with an infected prostate (2).

### LOCAL FINDINGS

The affected testis is usually drawn up to the upper scrotum or inguinal region. There is extreme tenderness. This may be so acute that adequate examination is impossible. Unless the testis has rotated through 360°, the epididymis, normally in a posteromedian position, will be abnormally placed. Elevation of the testis causes an increase in pain, a characteristic and almost diagnostic sign (5). Edema occurs rapidly and there is nearly always an accumulation of fluid within the tunica vaginalis. In the early stages this is serous but later it becomes *serosanguineous*.

### DIFFERENTIAL DIAGNOSIS

The principal condition that may cause confusion in the diagnosis of torsion of the spermatic cord is acute epididymitis, in which the onset is more gradual, there is early leukocytosis, there is usually some elevation of the temperature, the enlarged epididymis is usually palpable in a normal position, and elevation tends to relieve the distress.

Similar findings are present in acute epididymo-orchitis, but the symptoms are more fulminating. In primary acute orchitis the cord structures are usually normal. Strangulated hernia may simulate the rare extravaginal torsion. Differential diagnosis is not, however, difficult except in the presence of cryptorchism. Vomiting is more frequent in cases of strangulated hernia.

### TREATMENT

The treatment of this condition is always surgical. If detorsion is accomplished by manipulation, fixation of the involved testis and the opposite symptomless side is mandatory since the underlying congenital anomaly is usually bilateral. Adequate fixation is easily accomplished by excision of the parietal tunica vaginalis as performed in the usual hydrocelectomy. Spinal or local anesthesia is preferable.

When a reasonable doubt exists, scrotal exploration should be performed. The following case is illustrative.

*Case 1*—On 9 June 1947, an 18-year-old man was admitted 30 minutes after the onset of symptoms. He had recently been treated in this hospital for multiple urethral strictures, chronic urethritis, and cystitis. He had awakened with excruciating pain in the right testis, and had vomited once. He appeared acutely ill, and despite a normal temperature his leukocyte count was 14,000. His right scrotum was red and mildly edematous. His right testis was drawn upward to the external ring and because of severe pain, even after an injection of morphine, adequate local examination was impossible. Despite the known urinary tract infection, immediate exploration was performed under spinal anesthesia. On opening the tunica vaginalis, 4 cc of smoky amber fluid were removed. A blue, discolored testis and epididymis were lying free within the parietal tunica vaginalis, and extreme torsion of the spermatic cord was present. The torsion was corrected, and within 5 minutes the testis resumed its normal color. The parietal tunica vaginalis was excised, with fixation of the testis to the scrotal sac; a two-layer closure was performed without drainage, and convalescence was uneventful. Subsequently, the left scrotum was explored, revealing a free-lying testis and epididymis, with high investment of the cord, constituting the typical bell-clapperlike deformity. The patient was observed for several months and there was no atrophy of the right testis.

### REFERENCES

1. EWERT, E. E., and HOFFMAN, H. A.: Torsion of spermatic cord. *J. Urol* 51: 551-561, May 1944.
2. ORMOND, J. K.: Torsion of testicle. *J. A. M. A* 111: 1910-1914, Nov. 19, 1938.
3. MURCHAT, M.: Pathological anatomy of testicular torsion, explanation of its mechanism. *Surg., Gynec. & Obst.* 51: 758-763, May 1932.
4. NELSON, R. M.: *Fundamentals of Urology*. 3d edition, revised. J. W. Edwards, Ann Arbor, Mich., 1949.
5. CHRISTOPHER, F.: *Minor Surgery*. 5th edition. W. B. Saunders Co., Philadelphia, Pa., 1945.





# Primary Bronchogenic Carcinoma

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PRIMARY carcinoma of the lung is a curable disease if the diagnosis is made sufficiently early and if complete surgical removal is performed without undue delay. Since Evarts Graham performed the first successful pneumonectomy for carcinoma of the lung in 1933 the safe surgical technique for pneumonectomy has far surpassed the clinical advances in the early diagnosis of this lesion (1). Since 1933 several hundred successful pneumonectomies have been performed for cancer of the lung in this country. Thanks to the rapid improvement in endotracheal anesthesia, to whole blood transfusions, antibiotics, and the appreciation of the pulmonary physiology concerned in the pre- and post-operative care of these patients, pneumonectomy has become rather commonplace. We hope for further advances in this field of surgery, but are primarily concerned with the early diagnosis of this dreaded disease. Cancer of the lung comprises from 8 to 15 percent of all cancers in man. It therefore behooves all members of our profession to keep the possibility of this disease constantly in mind, and to exhaust all diagnostic aids to account for unexplained abnormal roentgenographic findings in the thorax associated or unassociated with symptoms.

This article analyzes the recent experience in the diagnosis and treatment of bronchogenic carcinoma at this hospital. In the military service we probably see a larger percent of young men with malignant disease than is ordinarily seen in civilian practice. In the past 5 years we have not encountered cancer of the lung in a female patient. *Ninety percent of our admissions have been men. Between 1 January 1944 and 31 December 1948, 91.2% patients were admitted to this hospital. Ninety-one had carcinoma of the lung, proved by histologic examination. The apparent or actual increase in the incidence of this disease is revealed by the fact that of the deaths in this hospital from 1921 to 1940 cancer of the lung was found at autopsy in 27 as compared*

<sup>1</sup> Fitzsimons General Hospital, Denver, Colo.

to 55 in the period from 1 January 1944 to 31 December 1948. The ages in this series varied from 22 to 76 years. Sixty-two percent were under 50 years of age and 8 percent were between the ages of 22 and 30 years. Eighty-five were white, five were Negroes, and one was Japanese.

Although the symptoms of primary carcinoma of the lung may be quite variable, most patients present a characteristic history. Initially, the symptoms resemble those of inflammation and depend on the size and location of the tumor as well as the degree of ulceration and obstruction of the bronchus. Seventy percent complained of cough, 55 percent had pain in the chest and weight loss at the time of admission, and 25 percent had hemoptysis. Of these 4 most prevalent symptoms of the disease, cough was the most common initial symptom. In nine patients the duration was less than 30 days and in 26 percent the presenting symptoms were of not over 90-day duration. In 14 patients the lesion was discovered by means of a routine roentgenogram of the chest. Seven of these patients were asymptomatic and five had already reached the inoperable stage. These data emphasize the necessity for immediate and thorough clinical study of patients with suggestive symptoms or findings and the desirability of routine roentgenograms of the chest.

Positive physical findings were more variable than the symptoms. Physical examinations of the chest were negative in 29 patients. Positive findings included various combinations of inspiratory and expiratory sibilant râles, fine to coarse râles, decreased expansion of the involved hemithorax and dullness over the suspected area. It was frequently noted that a relatively small tumor that occluded a main bronchus would give physical findings suggestive of atelectasis or pneumonia, while a peripherally located lesion of greater size that did not obstruct a main bronchus or invade the pleura would produce relatively few physical signs. The less frequent signs of cavitory disease were suggestive of abscess formation complicating the obstructing lesion. It is important to palpate for metastatic peripheral lymph nodes that may occasionally be found in the axillary, supraclavicular, and cervical regions. The involvement of such nodes indicates inoperability. The extent of the atelectasis or pneumonitis is no criterion of the size of the tumor: it generally exceeded the size of the neoplasm.

The late diagnosis of this disease can often be attributed to the insidious development and absence of symptoms in a small bronchial or peripheral pulmonary neoplasm. The patient or the physician often mistakes the carcinoma for pulmonary tuberculosis, virus pneu-

monia, bronchitis, asthma, bronchiectasis, or a chest cold, causing unnecessary delay in establishing the true diagnosis. Often temporary improvement is seen when the bronchial obstruction is intermittent or when antibiotics are employed with temporary abatement of complicating symptoms. These factors often add to the delay in arriving at the correct diagnosis. Jones (2) states that "clinical improvement following antibiotic or chemotherapy without complete roentgenographic clearing of a bronchopulmonary lesion in an adult is indicative of at least a tentative diagnosis of primary bronchiogenic new growth until proved otherwise." We strongly concur in this statement. The most important factor in the early diagnosis of this disease is for the physician to require roentgenographic study of the chest in patients with chest symptoms and to demand surgical exploration for unexplained abnormal roentgenographic findings. A history of previous pulmonary disease is of interest but of no particular diagnostic significance. Studies relative to smoking among patients indicate it to be a factor in this disease. The diagnostic aids employed in this study included (a) roentgenography (routine and special projection roentgenograms of the chest, fluoroscopy, tomograms, bronchograms, and studies for bone metastasis); (b) physical examination; (c) bronchoscopy; (d) sputum and bronchial secretion studies for tumor cells; (e) biopsy of a specimen from the peripheral lymph nodes; (f) study of pleural fluid for tumor cells; and (g) exploratory thoractomy. Table 1 indicates the initial or early clinical diagnoses made in our series and table 2 indicates the particular method by which the true diagnosis was accomplished. The roentgenographic appearance of bronchiogenic carcinoma has no distinctive characteristics. The finding of abnormalities is, therefore, an indication that complete clinical investigation is urgently required. In some cases this may include exploratory thoracotomy (figs. 1, 2, 3, and 4).

TABLE 1—Initial clinical diagnoses in 91 patients with carcinoma of the lung

Initial clinical diagnosis	Number of patients	Initial clinical diagnosis	Number of patients
Carcinoma of the lung	25	Atelectasis	2
Undiagnosed pulmonary disease	22	Pleural effusion	2
Tuberculosis	11	Neurofibroma	1
Carcinoma, primary, site unknown	9	Lobar pneumonia	1
Bronchiectasis	6	Pulmonary cyst	1
Atypical pneumonia	3	Mediastinal tumor	1
Lung abscess	3		
Asthma	4	Total	91

This procedure may yield important information although the actual tumor may not be visualized. Narrowing, distortion, and fixation of bronchi offer aid in determining the nature of the pulmonary process and may assist in the evaluation of operability.

TABLE 2.—*Means by which true diagnosis was arrived at in 62 of 91 patients with carcinoma of the lung*<sup>1</sup>

	Number of patients
Biopsy of specimen removed bronchoscopically.....	38
Biopsy of specimen of peripheral lymph nodes, mediastinal lymph node, or chest wall.....	11
Biopsy of specimen of lung at thoracotomy or lobectomy.....	8
Malignant cells demonstrated in pleural effusion.....	1
Malignant cells demonstrated in sputum and bronchial secretion.....	4
Total.....	62

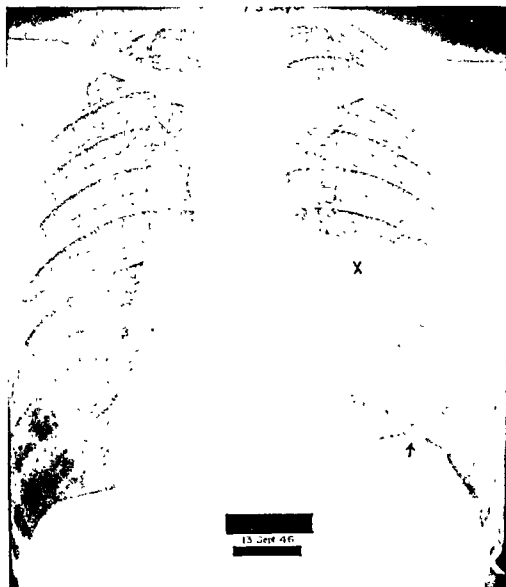
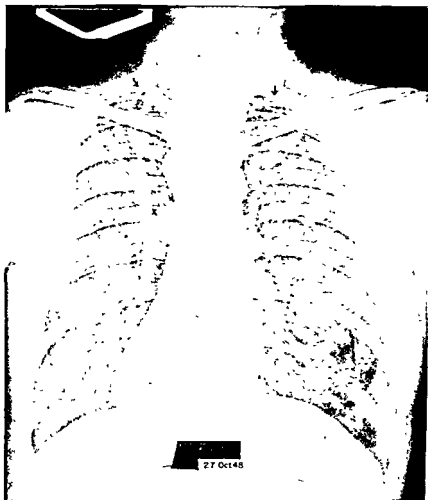
<sup>1</sup> The remainder were diagnosed at autopsy

Figure 1.—Roentgenogram of chest of 47-year-old man with symptoms of 4 months' duration. The X marks a bronchogenic carcinoma. The arrow indicates what is probably an elevation of the diaphragm. The right lower lobe of the lung was removed and the patient was alive 3 years later.



*Figure 2—Roentgenogram of chest of 53-year-old man with symptoms of 2 years' duration. The X marks a bronchogenic carcinoma. The arrows indicate probable pleural thickening. Biopsy showed evidence of carcinoma of the lung. A palliative pneumonectomy of the left lung was performed.*

In attempting to arrive at a feasible method of management of carcinoma of the lung we have adopted these criteria. *First*, surgical excision offers the only hope of permanent cure. *Second*, surgical excision offers the best means of affording palliation in patients in whom complete removal of the tumor cannot be accomplished, if there is no evidence of metastases to distant organs. Ochsner (3) and his associates have stated that "70 percent of the resections were considered palliative rather than curative since the lesions had extended beyond the confines of the lung. Palliative resections are considered justifiable because the risk is not excessive, the patient's remaining

span of life is more comfortable, and the average survival period is increased." Our experience has been similar and we explore all patients in whom the diagnosis of cancer of the lung has been established who do not have (a) involvement of the tracheal wall, (b) metastatic lesions to distant nodes and organs, (c) malignant cells in the pleural fluid, and (d) conditions that preclude operative intervention such as severe cardiac or renal disease.

Radiation therapy has been used in those patients who were inoperable; it has been of doubtful value. In 22 of our patients the tumor

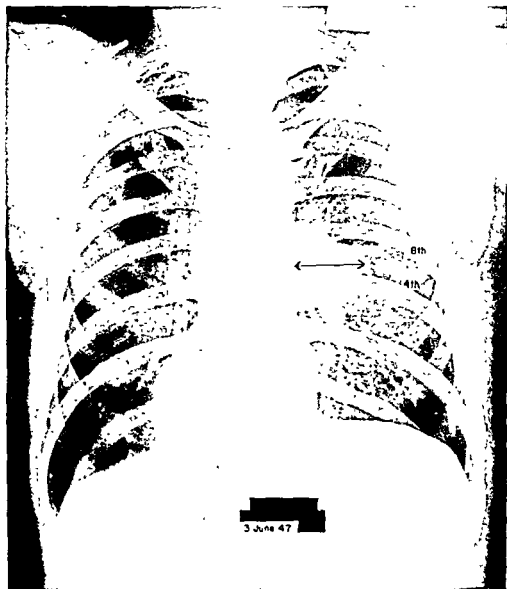


Figure 3.—Roentgenogram of chest of 57-year-old man with no symptoms. The carcinoma in his right lung was discovered by routine roentgenogram. The arrows indicate the site of the lesion. He was alive and working 2 years and 9 months after pneumonectomy of the right lung. The numbers identify ribs.



*Figure 4—Roentgenogram of chest of 53-year-old man with symptoms of 9 months' duration. A large cavity is seen in the right upper lobe of the lung. The arrows indicate the site of the lesion. An exploratory thoracotomy was performed but the tumor could not be removed.*

was removed by pneumonectomy, in 6 by lobectomy, and in 1 by partial lobectomy. In about 50 percent the resections were considered palliative. There were 3 operative deaths. Four of the patients in this series were alive 2½ years or more following operation. Ochsner has shown that 25.9 percent of the patients survive 2 years after resection and that such patients have an excellent chance of 5-year survival.

#### CASE REPORTS

*Case 1*—A 41-year-old officer was admitted to this hospital on 9 October 1947 with a diagnosis of pleuritis chronic right, serofibrinous, tuberculous. He had been in good health until March at which time he developed a slight nonproduc-

tive cough, chills, and night sweats. A roentgenogram of the chest revealed fluid in the right pleural space. He was treated with antibiotics and improved. He was returned to duty at his own request in April and was told that the fluid in his chest would absorb (figs 5 and 6). He was asymptomatic for about 2 months when chills, fever, and night sweats recurred and he had a productive cough. He was admitted to another hospital where 50 cc. of bloody purulent fluid were obtained from the right pleural space by thoracentesis. The sputum was negative for tubercle bacilli and a roentgenogram of the chest revealed the pleural effusion to be increasing. The treatment consisted of bed rest. The patient grew rapidly worse. The clinical impression was pulmonary tuberculosis, moderately advanced, bilateral, with effusion in the right pleural space. Soon after admission he had symptoms of an obstructive jaundice. He was transferred to this hospital on 9 October. On 31 October bronchoscopy revealed a mass in

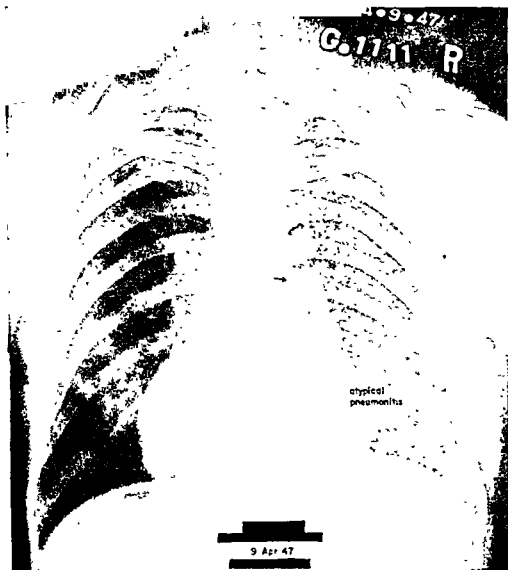
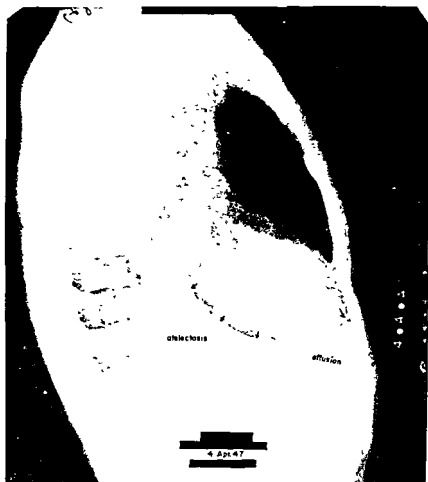


Figure 5—Case 1. Roentgenogram of chest. The arrow indicates the site of the bronchogenic carcinoma. The lesion marked "atypical pneumonitis" warranted complete investigation. The patient died 8 months later of carcinoma of the right lung.





*Figure 6—Case 1 This roentgenogram shows the importance of a lateral projection as an aid in diagnosis. The atelectasis warranted complete investigation. The arrows indicate the site of the lesion.*

the right main bronchus. Biopsy of a specimen taken from this mass revealed a carcinoma and a specimen of a subcutaneous metastatic lesion of the right chest wall revealed a similar type of carcinoma. The patient died on 1 December. The post-mortem diagnosis was carcinoma bronchogenic, undifferentiated, right, with metastasis to hilar and paratracheal nodes, adrenals, right kidney, pancreas and brain. A proper investigation 6 months earlier might have permitted removal of the lesion and cure.

**Case 2**—A 47-year-old veteran had been well until 1943 when he had a severe chest cold from which he never completely recovered. After a 2 month hospitalization he was discharged from the Army because of bronchitis. There were three subsequent admissions to hospitals for bronchitis. In December 1945 he was admitted to this hospital with pneumonia which, except for a small area

in the right lung, responded to penicillin therapy. He was discharged within 2 weeks and continued to work but was bothered by malaise, weakness, and cough productive of foul sputum. A roentgenogram of the chest was made at the request of the out-patient department in January 1946 (fig 7). In September 1947 he had hemoptysis and was readmitted to this hospital. A roentgenogram of the chest revealed a demarcated, lobulated density in the midportion of the right lung (fig. 8). Bronchoscopy showed an obstructive lesion of the right lower lobe bronchus. Microscopic examination of a specimen of the mass disclosed bronchogenic carcinoma. A right pneumonectomy was performed on 23 September. He died on 7 December 1947. A more complete study in January 1946 might have revealed the true nature of this lesion.

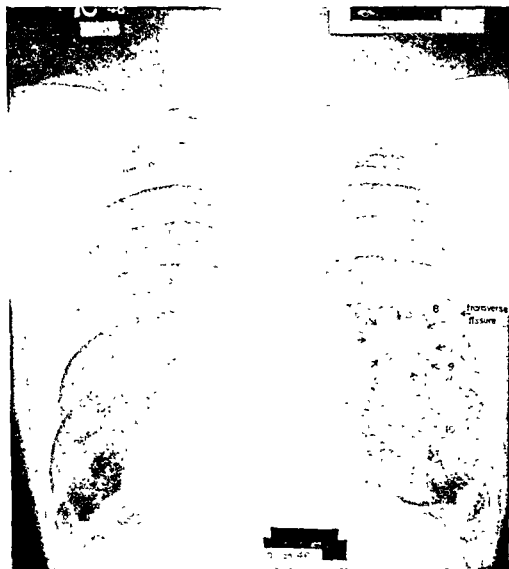


Figure 7.—Case 2. Roentgenogram of chest. The lesion in the right lung indicated by arrows warranted complete investigation. Numbers identify ribs. The patient died 23 months later of carcinoma of the right lung.

TABLE 3—*Histopathologic classification of 91 cases of carcinoma of the lung*

<i>Classification</i>	<i>Number of cases</i>
Squamous cell.....	45
Adenocarcinoma.....	19
Undifferentiated.....	10
Miscellaneous	
Gelatinous adenocarcinoma.....	1
Adeno-alveolar.....	3
Mixed adenocarcinoma and squamous.....	1
Mixed undifferentiated and squamous.....	1
Mixed anaplastic and squamous.....	1
Type undetermined.....	1
Total.....	91

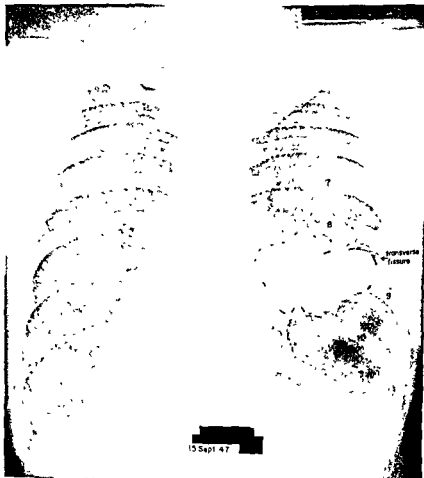


Figure 8—Case 2 Later view of same lung taken 2½ months before death.  
Numbers identify ribs

All bronchogenic carcinomas are highly malignant. The histopathologic classification in this series is shown in table 3. At no time did microscopic study of the tissue and the histopathologic classification influence the operative treatment if a patient was judged operable from a clinical standpoint.

#### SUMMARY

Pulmonary cancer is now as common as any tumor involving the internal organs in male patients. The disease is believed to be increasing in frequency. The most common symptoms are cough, chest pain, weight loss, and hemoptysis, and patients often present a history pattern suggestive of this disease. Early diagnosis and surgical exploration may save or prolong life. Four patients in the series of 91 patients here reported have survived longer than 2½ years after complete or partial surgical removal of the tumor. Palliative resection of the lesion is recommended.

#### REFERENCES

1. GRAHAM, E. A., and SINGER, J. J. Successful removal of entire lung for carcinoma of bronchus. *J. A. M. A.* 101: 1371-1374, Oct. 28, 1933.
2. JONES, J. C. Surgical aspects of bronchogenic carcinoma. *J. A. M. A.* 131: 113-117, May 10, 1947.
3. OCHSNER, A., DEBAKEY, M. E., DUNLAP, C.; and RICHMAN, I. Primary pulmonary malignancy. *J. Thorac Surg.* 17: 573-599, Oct. 1948.



# The Ante-Mortem Diagnosis of Secondary Tumors of the Heart

## Report of Four Cases

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SECONDARY tumors of the heart or metastasis to the heart have been considered rare, and various writers have reported the incidence as varying from 0.28 (1) (2) to 10.9 percent (3). Brick and Greenfield (4) in reporting reticulum cell sarcoma with cardiac metastasis, made an extensive review of the literature through 1946. From various surveys of autopsies from leading medical centers, they concluded that the frequency of cardiac involvement varies from 0.03 to 1.4 percent of the total number of autopsies and from 1.0 to 10.9 percent of the total number of cancers. They further noted that up to the time of writing their article, a total of 22 cases of tumor of the heart had been diagnosed ante mortem, of these tumors, 4 were primary (4) (5) (6). Since that report, Blumenthal and Peterson (7) reported the ante-mortem diagnosis of metastatic carcinoma of the heart secondary to a carcinoma of the cecum. A case of constriction of the pericardial sac by a neoplasm secondary to bronchogenic carcinoma was reported by Fischer (8). Ritz (9) reported a case of metastatic tumor of the heart from malignant melanoma, in which ante-mortem diagnosis was made by cell block of pericardial fluid.

In a review of 1,815 autopsies at the U. S. Naval Hospital, Philadelphia, Pa., from 1943 to 1949, 455 cases of malignant tumors were found. Of these, 38 or 8.35 percent were found to have secondary involvement of the heart. In 4 or 10.5 percent an ante-mortem diagnosis was made histologically or else tentatively diagnosed as the cause of cardiac signs and symptoms before death and confirmed by autopsy.

### CASE REPORTS

*Case 1*—G. A. L., a 68-year-old white man, was admitted to the hospital on 21 April 1947 complaining of a mass in the right axilla which had been found 10 days prior to admission.

*Past history.*—He had had occasional episodes of anorexia and dull aching pain in the right upper quadrant of the abdomen and black stools and constipation over a period of 9 years. Four years prior to admission a mole on his back had been cauterized without recurrence. Past history was negative for cardiac disease or symptoms. His best weight was 180 pounds, in 1931.

*Physical examination.*—The patient weighed 134 pounds, his blood pressure was 160/80 and the pulse rate 60 per minute. A firm, nontender, lobulated mass about 6 cm. in diameter was present in the right axillary space, seemingly attached to the pectoralis muscles. The heart examination revealed bigeminal rhythm. A systolic murmur was heard best at the apex, fading toward the base. The rest of the examination was essentially normal.

*Laboratory data.*—Urinalysis and red and white blood cell counts were normal; hemoglobin, 11 gm.

*Roentgenographic examination.*—Roentgenograms showed a duodenal ulcer with some contraction deformity. Barium enema was negative. A chest roentgenogram showed increased bronchovesicular markings.

*Electrocardiographic and microscopic examinations.*—On 22 April 1947 an electrocardiogram revealed a rate of 60 per min with sinus arrhythmia and sinus arrest. PR interval was 0.17 sec.; QRS was 0.08; the Q-waves, 1 mm. deep in leads 2 and 3. S-T segment was normal.

An electrocardiogram on 8 May 1947 showed complete heart block with the PR interval varying from 0.16 to 0.23 second. Every third P-wave, QRS complex, and T-wave were dropped. The S-T segment became isoelectric in leads 1, 2, and 3.

On 15 May 1947, under local anesthesia, a biopsy specimen was removed from the right axillary mass. The microscopic appearance was that of undifferentiated sarcoma compatible with malignant melanoma.

An electrocardiogram on 18 May 1947 showed a continued block and no change from the record of 8 May 1947.

*Tentative diagnosis.*—Secondary neoplasm of myocardium.

On 10 June 1947, the right axillary nodes were resected and the microscopic examination showed an undifferentiated sarcoma compatible with malignant melanoma.

*Out-patient course and return to hospital.*—The patient left the hospital on 18 June 1947 only to be readmitted 12 September 1947 with widespread pulmonary metastasis. He then had bilateral pleural effusion, progressive chest pain on slight exertion, dyspnea, orthopnea, and ankle edema. Cardiac examination revealed bigeminal rhythm and a murmur similar to that noted on previous admission. Blood pressure was 185/90.

A low fluid intake, salt-free diet, and digitalis were prescribed. His course was downhill and he died 28 September 1947.



Figure 1.—Case 1. Low-power magnification showing the neoplasm invading the myocardium in the region of the atrioventricular node.

**Autopsy**—The autopsy showed malignant melanoma of the right axillary region with metastases to the lungs, liver, pancreas, and thyroid. A chronic duodenal ulcer was present. The heart weighed 330 gm. and was normal in contour. The major vessels and coronary arteries were patent. On sectioning, two metastatic tumor nodules were observed, both approximately 1 to 2 cm. in diameter and located at the atrioventricular junction on the right side. The right ventricular wall measured 4 mm., the left 14 mm. in thickness. The valve leaflets were slightly thickened, the chordae tendineae and papillary muscles were not unusual.

Tumor nodules were found in the atrioventricular node area. Upon microscopic examination these were typical of malignant melanoma, showing evidence of infiltration into the surrounding myocardium.

**Case 2**—H. H. C., a 52-year-old white man, was first admitted to the hospital in November 1944, complaining of sharp, steady, and nonthrobbing pain in the left thorax and arm which began in 1942. His family and past histories were noncontributory.

**Physical examination**—Examination revealed coarse rhonchi, inspiratory and expiratory rales over both lung fields. On percussion, the mediastinum was found to be widened and the heart to be enlarged. Frequent extrasystoles were audible. Blood pressure, right, 130/90, left, 120/60.

**Röntgenographic examination**—A chest roentgenogram revealed a very large, somewhat lobulated area of increased density protruding from the left hilum to the outer fourth of the left lung field. The heart and mediastinum were displaced to the right and the trachea and esophagus were displaced posteriorly.

**Laboratory data**—Red and white blood cell counts were normal, hemoglobin, 12.5 gm. The blood Kahn test was negative. Urinalysis was negative.

**Electrocardiographic examinations**—An electrocardiogram revealed a rate of 108 per min. and extrasystoles. P-R interval was 0.18 sec., QRS complex, 0.06 sec. R-S-T segment was isoelectric. The T-waves were normal.

**Hospital course**—In March 1946, a thoracotomy was performed and what was thought to be an inoperable tumor extending into the pericardial cavity was found. The patient was discharged after convalescence and readmitted in October 1946. At this time, dyspnea and chest pain were more severe. A roentgenogram of the chest revealed little change in tumor density. In November 1946, via an anterior thoracotomy, partial removal of the mass was performed. Following this surgery the patient died.



**Figure 2**—Case 2. A high-power magnification showing the bronchial adenoma in the myocardium with infiltrating fingers of neoplastic tissue surrounding cardiac muscle.

**Autopsy**—Post mortem examination revealed a solid tumor filling a major portion of the mediastinum and a major portion of the left lung. The resected specimen was filled with multiple lobulations of white solid tumor. A residual pyelonephritis with nephrotic changes was present.

The heart weighed 465 gm. The pericardium was rough, dull, and showed involvement by direct extension

of the mediastinal tumor mass. The ventricles were slightly hypertrophied and there was slight thickening of the mitral leaflets but otherwise the heart was grossly normal.

Microscopic examinations proved the tumor to be a bronchial adenoma. A focal site of neoplastic tissue identical with the lung sections was observed in the left ventricle. Infiltration was noted about the ill-defined margins of the neoplastic tissue.

*Case 3.*—W. G. G., a 57-year-old white man, was admitted on 6 May 1946 complaining of weakness, dyspnea after walking the distance of one-half block, weight loss of 13 pounds, and abdominal pain of 2-month duration. His general health had been good prior to his present illness.

*Physical examination.*—On admission, his pulse rate was 108 and blood pressure, 160/100. The heart showed regular rhythm and no murmurs or enlargement. The neck veins were noticeably distended. The liver was palpable at the right costal margin. No peripheral edema was present.

*Laboratory, roentgenographic, and microscopic data.*—Red blood cells, 3,100,000; white blood cells, 15,100. Hemoglobin was 85 gm. Sedimentation rate was 35 mm./60 min. Roentgenograms were not significant. A biopsy of a specimen from a mass in the left lower lobe bronchus revealed squamous cell carcinoma.

*Electrocardiographic examination.*—An electrocardiogram taken 10 May 1946 revealed a rate of 92 per min. with normal rhythm. P-R interval, 0.14 sec. The QRS, 0.08 sec. duration with low voltage and slurring in the limb leads. The S-T segment was isoelectric. The T-waves were flattened in lead 2 and inverted in lead 4.

*Course and diagnosis.*—His course was downhill with evidence of cardiac decompensation. His temperature varied from 99° to 102° F. In light of these findings, a tentative diagnosis of secondary carcinoma of the heart was made. He died on 2 June 1946.

*Autopsy.*—The post-mortem examination revealed a primary squamous cell carcinoma of the lower lobe of the left lung with superimposed bronchopneumonia and multiple small lung abscesses. Secondary carcinoma of the squamous cell type was found in the liver and kidneys. A small aneurysm of the abdominal aorta and a moderate degree of atherosclerosis of the aorta were found.

The heart weighed 130 gm. The major vessels were patent. The epicardium of the anterior surfaces of the right and left ventricles was covered with a shaggy, granular, yellowish brown fibrinous exudate. The valves and endocardium were grossly normal. The left ventricular wall measured 20 mm. in thickness. The interventricular septum revealed small, white, firm, solid flecks scattered diffusely throughout the myocardium. Microscopically, the interventricular septum was found to be infiltrated with secondary squamous cell carcinoma, scattered round-cell infiltration was present about the margins of the tumor.



*Figure 3.*—Case 3. Low-power magnification showing the squamous cell carcinoma invading the surrounding myocardium and extending along the fibrous septi.



**Case 4**—B J P., a 22-year-old white man, was admitted to the U. S. Naval Hospital Philadelphia, Pa., on 7 July 1948. In April 1947 he had been hospitalized at Walter Reed Hospital where biopsy of a specimen of a mediastinal tumor was reported as being a cavernous hemangioma. However, on review of the slides it was subsequently thought to be malignant teratoma.

At the time of entry into this hospital, he complained of severe substernal pain of 5-week duration with extreme dyspnea of 2-week duration. He was unable to lie flat in bed and had insomnia for this reason. He complained of coughing and nausea and had lost 12 pounds in the month prior to admission.

**Physical examination**—His pulse rate was 96 per minute; respiratory rate, 18 per minute. Temperature and blood pressure were normal. The chest showed dullness on the right side from 3 centimeters above the tip of the scapula downward and there was impairment of breath sounds. The neck veins were greatly distended. A soft mass was felt in the left supraclavicular region. The liver was enlarged, soft, and tender.

**Röntgenographic examination**—A chest roentgenogram showed pleural effusion on the right side and an operative defect of the left sixth rib posteriorly. Obliteration of the left costophrenic angle was also seen.

**Hospital course**—He became increasingly dyspneic. Thoracentesis gave partial relief and examination of the fluid showed no tumor cells.

After 16 July 1948, his temperature remained about 101° F orally, daily. Despite repeated thoracentesis his dyspnea and right side heart failure con-

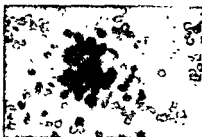


Figure 4—Case 4. High-power magnification of clumps of neoplastic cells found in the effusion fluid.

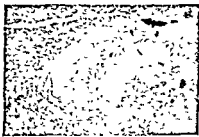


Figure 5—Case 4. A low-power magnification showing the masses of neoplastic cells isolating bundles of cardiac muscle. Note the pseudo-acinar formations in the neoplastic tissue.

tinued. The fluid obtained at thoracentesis on 20 August 1948 was found to contain neoplastic cells (fig. 4).

Because the pleural effusion was due to a neoplastic lesion, the pericardial effusion was logically attributed to the same factor. Repeat roentgenograms of the chest showed mediastinal infiltration with pericardial involvement.

A biopsy specimen from the left supraclavicular region showed a secondary undifferentiated tumor of a lymph node.

Laboratory studies showed the removed pleural fluid to contain 4 percent solid matter. Repeated cultures of the pleural fluid showed no bacterial growth. The red blood cell count varied between 4.4 and 5.3 million; the hemoglobin from 12.5 to 14.5 grams percent, the white blood cell count from 6,500 to 11,200.

with the average differential count showing 76 percent polymorphonuclear neutrophils, 8 percent eosinophils, 2 percent basophils, and 14 percent lymphocytes. Total serum proteins were 4.45 grams percent. The blood Kahn test was negative. A bromsulfalein test with 5 mg of dye per kilogram revealed 32 percent dye retention in 30 minutes. Sputums were repeatedly negative for acid bacilli. The patient continued to have fever, to lose weight, and became dyspneic. He died 9 October 1948.

*Autopsy.*—Autopsy was limited to the chest. The pleural cavity on the right side contained 1,250 cc and the left 1,200 cc of a bloody coagulative material showing a specific gravity of 1.022. The pericardial sac contained a similar fluid totaling 500 cc. The pleural and pericardial surfaces were studded with white tumor nodules which varied from 4 mm. to 2 cm in diameter.

The lungs, in addition to tumor extending into the lung parenchyma from the hilar regions, showed multiple zones of atelectasis. The mass weighed 1,250 grams.

The tumor had infiltrated around the great vessels entering and leaving the heart. The heart weighed 175 grams. Upon section, the myocardium was atrophic, the left ventricle measuring 8 mm in thickness, the right 4 mm. Tumor infiltration into the myocardium extended beneath the pericardium.

#### DISCUSSION

In case 1, the diagnosis of a melanoma was established prior to death. In this case, the cardiac symptoms and signs occurred after the appearance of the melanoma. It was logical to tentatively consider the pathologic heart changes to be due to a metastatic lesion until ruled out by clinical course or other means.

The diagnosis was confirmed at autopsy; the tumor was so located in the region of the heart that alteration of rhythm would very likely be initiated.

In case 2, surgical observation showed the tumor to extend into the pericardial cavity and when cardiac symptoms occurred it was postulated that myocardial invasion was the likely cause. However, it was not certain that the tumor in the ventricle was responsible for his cardiac condition since the pericardial and pulmonary pathologic changes could well have been the responsible factors.

In case 3, the patient was observed for 27 days. He was known to have a malignancy of the bronchus. His cardiac signs and symptoms were thought to be out of proportion to the degree of arteriosclerosis. The electrocardiogram was of some help in ruling out thrombosis and infarction. With the existing neoplasm and its tendency to metastasize to the myocardium, it was logical to consider the presence of secondary neoplasm of the myocardium in addition to arteriosclerosis. Also considered in the differential diagnosis was mural thrombosis or neoplastic extension via the pulmonary veins. No obstructive phenomenon was demonstrated. The numerous areas of neoplastic infiltration found at autopsy were small and scattered, and conse-

quently these did not alter the electrocardiogram in any appreciable fashion.

In case 4, a diagnosis of pleural involvement by a neoplasm was made on finding neoplastic cells in the pleural effusion and the presence of signs of mediastinal involvement. The exact site of the superior vena cava obstruction was not clear and intra- and extra-pericardial sites were thought to be the best possibility. From the autopsy findings it appeared that both the infiltration of the myocardium and the obstruction of the blood entering and leaving the heart chambers, in addition to the pressure from the pericardial effusion, were factors in the production of his cardiac signs and symptoms.

The cardiac changes which occur following primary and secondary tumors of the heart are similar. No matter which exists, when an infiltrative expanding process is present it produces the same effects.

In an article by Hamilton-Paterson and Castleden (10) pseudotumors arising from organization of blood clots and aneurysms, give patterns of cardiac disease not unlike primary sarcoma of the heart. Brick and Greenfield (4) emphasized the view of Scott and Garvin (3) that patients with known malignant neoplasms who have cardiac failure should be suspected of having secondary neoplastic disease of the heart. This sign alone probably outshines all the other findings, including changes in rate, rhythm, and displacements of the segments in the electrocardiogram.

The literature (4) (11) (12) (13) indicates that high-voltage roentgen therapy may prolong the life of the patient as well as relieve the distressing signs and symptoms which may accompany the secondary lesions in the heart.

In the four cases presented the primary lesions were in the bronchus, the skin, and the embryonal tissue of mediastinum. However, the primary lesion may be in any organ: in the majority of cases, the breast and bronchus have been the primary sites. Lung involvement is a common finding when malignant cardiac invasion is present regardless of which organ is primarily involved. The heart may be invaded by direct extension, by lymphatic permeation, or by metastatic phatics, or artery. Pericardial involvement is frequent.

Direct extension or lymphatic permeation are the probable routes to the pericardial surfaces. The site of involvement is more important than the extent of involvement in myocardial metastasis, but the extent of involvement seems to be more important in metastatic pericardial lesions.

At this hospital 90 percent of the patients with metastatic lesions of the heart who had no signs or symptoms were unsuspected of having such lesions before autopsy.

The failure to make an ante-mortem diagnosis in cardiac malignancy probably depends on several factors. The symptoms are quite variable and cardiac symptoms may be absent or else sudden as severe heart failure or bizarre arrhythmia may occur. The ample heart reserve, the lack of valvular involvement, and the absence of acute infarction and debility of the patient may not arouse suspicion of a cardiac lesion. Failure of the involved heart may be difficult to detect in patients showing a picture of chronic constrictive pericarditis as reported by Wallace and Logue (14), Fischer (8), Lisa et al. (15). They pointed out that in patients showing evidence of congestive heart failure who are refractory to treatment cardiac tumors should be suspected, especially if there is no obvious cause for cardiac failure.

It is interesting that in our patients the lesions occurred in or extended into the substance of the myocardium. In one patient invasion of the atrioventricular node was demonstrated as the probable cause of arrhythmia. The changes in the electrocardiograms parallel ischemic lesions of the myocardium or extensive scar replacement of the muscle fibers. Mayhaim (16) described a secondary cardiac tumor in which the sino-atrial node was destroyed and rhythm was determined by the atrioventricular node.

Positive diagnosis of metastatic tumors of the heart can only be made on histologic examination of the myocardium. Nevertheless, the possibility of metastasis to the myocardium should be kept in mind. When unexplained cardiac signs and symptoms occur in a patient with a malignant tumor and when little or no cardiac abnormality was previously observed, the ante-mortem diagnosis of secondary tumor of the myocardium can be made with some degree of certainty.

#### SUMMARY

Secondary tumors of the heart are not rare. During a 6-year period they were noted in 8.35 percent of all necropsies performed on patients who had malignant neoplasm.

Any patient harboring a known malignant neoplasm who shows cardiac signs should be suspected of secondary involvement of the heart.

#### REFERENCES

1. NICHOLS, A. G : Secondary carcinoma implanted on endocardium of right ventricle. *Canad. M. A. J.* 17: 738-800, July 1927.
2. MORRIS, L. M : Metastasis to heart from malignant tumors. *Ann. Heart J.* 3: 219-229, Dec. 1927.

- 3 SCOTT, R W., and GARVIN, C F · Tumors of heart and pericardium *Am Heart J* 17: 431-436, Apr 1939
- 4 BRICK, I B., and GREENFIELD, M · Reticulum cell sarcoma with cardiac metastasis; report of two cases with ante-mortem diagnosis of one. *Am Heart J* 34: 599-611, Oct 1947
- 5 DOANE, J C., and PRESSMAN, R · Antemortem diagnosis of tumors of the heart *Am J M Sc* 203: 520-524, Apr 1942
- 6 RABIN, J M., and SACHS, J · Tumors of heart, with report of primary fibromyxosarcoma of left auricle and pulmonary vein, associated with multiple tumors of mesentery and alimentary tract. *Am Heart J* 26: 385-397, Sept 1943
- 7 BLUMENTHAL, J S., and PETERSON, H W · Metastatic carcinoma of the heart; report of sole metastasis from carcinoma of cecum diagnosed before death. *Minnesota Med* 30: 860-862, Aug 1947
- 8 FISCHER, J W · Neoplastic involvement of pericardium producing the syndrome of constrictive pericarditis *Am Heart J* 35: 813-819, May 1948
- 9 RITZ, N D · Diffuse melanosis pericardial effusion and melanuria associated with malignant melanoma *Am J Int Med* 30: 184, 1949
- 10 HAMILTON-PATERSON, J L., and CASTLEDEN, L I M · Intracardiac tumors. *Brit Heart J* 4: 103-114 July 1942
- 11 HSUNG J C., SUTU, C., HSIEH C K., and LIU, V. T · Metastatic tumors of heart, report of 2 cases diagnosed clinically *Chinese M J* 57: 1-15, Jan 1940
- 12 RIVIO, M · Hodgkin's disease, report of case with unusual longevity and invasion of heart and pericardium *New England J Med* 223: 891-895, Nov 28, 1940
- 13 SHELBURNE, S A., and ALMONSON, H S · Tumors of heart, report of secondary tumor of heart involving pericardium and bundle of His with remission following deep roentgen-ray therapy *Ann Int Med* 14: 728-730, Oct 1940
- 14 WALLACE, J J., and LOUIE, R B · Metastatic carcinoma as cause of constrictive pericarditis, report of case *Am Heart J* 31: 223-230, Feb 1946
- 15 LISA, J R., et al · Cited in Fischer (8)
- 16 MAYHAIM, I · Cited in Fischer (8)



# Idiopathic Thrombocytopenic Purpura

## Splenectomy and Toluidine Blue in Treatment

MARION T. YATES, *Commander (MC) U. S. N.*<sup>1</sup>

PURPURA is a condition in which hemorrhages or ecchymoses occur in the tissues because of an alteration in the capillaries, or the blood, or both. Capillary alteration has been assumed to be due to defects in the vascular endothelium: the capillaries are either unable to contract when injured or else they are unusually permeable. Recently Humble (1), employing capillary microscopy, has studied the mechanism of hemorrhage in 17 cases of purpura. Five of these were idiopathic thrombocytopenic purpura and in these he found the mechanism to be the same in all cases. In the arteriolar end of the capillary loop, the part from which tissue fluid normally leaves the vessels he observed a shower of red cells hurled from the vessels. No breach of the blood stream in the capillary was evident nor was the capillary obliterated by the pressure of effused blood. He postulates a selective poisoning of this junction.

Other workers believe that thrombocytopenia may be the result of decreased platelet formation, or increased platelet destruction, or increased requirements of platelets. Any factor in the clotting mechanism may be defective; there may be a deficiency of thromboplastin, prothrombin, calcium, or fibrinogen. Allen and Jacobson (2) indicate that purpura may at times result from hyperheparinemia.

### CLASSIFICATION

The author prefers Murphy's (3) classification of purpura. For the practicing physician it is simple, clear, and workable, and is therefore worth repeating:

1. *Primary purpura (idiopathic, essential)* --The cause is unknown: No associated disease that may be the cause of the purpura is found.

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2. *Secondary purpura*.—Secondary purpura refers to those cases in which another disease is considered to be the cause.

(a) Secondary thrombocytopenic purpura in which thrombocytopenia is one of the main features. It is seen in myelophthasic anemia, pernicious anemia, the leukemic aplastic anemia, and platelet depression from irradiation, radium or drugs.

(b) Secondary purpura without thrombocytopenia. This condition is noted in

(1) Acute infections such as cerebrospinal meningitis, measles, scarlet fever.

(2) Toxic or allergic states caused by such agents as quinine, gold salts, barbiturates, mercury, sulfonamides, quinacrine iodides, arsenicals, salicylic compounds, pertussis vaccine, estradiol benzoate, blood transfusions.

(3) Constitutional debility such as chronic nephritis, cancer, syphilis, scurvy and other avitaminoses.

(4) Septic infections such as subacute bacterial endocarditis, meningococemia.

Every effort should be made to distinguish the idiopathic from the secondary variety. This is important because the treatment of the two types is very different. Treatment of secondary purpura resolves itself into the treatment of the underlying disease. For idiopathic thrombocytopenic purpura splenectomy is resorted to. It often cures. This operation, even though it has been performed for the past 33 years, still rests on an empirical basis.

#### INCIDENCE

In a series of 90 cases (4) of idiopathic thrombocytopenic purpura the incidence of females to males was 3:1. It was found most commonly in those under 25 years of age (58.9 percent). In this 27-year study only 2 cases were seen in males over 25 years of age.

#### PATHOLOGY

The pathology of secondary purpuras varies with that of the underlying disease. In idiopathic purpura there is thrombocytopenia and hemorrhagic manifestations with a paucity of other significant findings. No constant pathologic change is found microscopically. Nickerson and Sunderland (5) describe the following changes in the spleen: enlargement and activity of the germinal centers, megakaryocytes in pulp sinuses, neutrophilic and eosinophilic leukocytes increased in splenic pulp sinuses.

#### DIAGNOSIS

*Chief features in diagnosis*.—The chief features in diagnosis are:

(a) A great reduction of platelets.

(b) Prolonged bleeding time.

(c) Normal clotting time, but delayed or absent clot retraction.

(d) The red and white blood cell counts are normal, except as noted in differential diagnosis.

(e) A decreased capillary resistance as shown by the tourniquet test: petechial hemorrhages occur over the entire forearm below the level of the blood pressure cuff.

*Differential diagnosis.*—This involves the exclusion of all factors known to cause secondary purpura. In idiopathic thrombocytopenic purpura the spleen is occasionally palpable. However, a very large spleen would make one think of leukemia with purpuric manifestations. Purpura with leukopenia would make one think of aplastic anemia or an aleukemic leukemia. A leukocytosis is found in the presence of secondary infections. Anemia, when present, is not out of proportion to the blood lost.

#### SPLENECTOMY AS TREATMENT

Other than medical management, including repeated transfusions, bed rest, a high-calorie diet, good nursing, symptomatic therapy, removal of focal infection when found, and use of antibiotics when indicated, splenectomy is offered as the sheet anchor of therapy. The impression is that splenectomy is practically infallible.

Haden (6) states: "Splenectomy in the acute cases should be done if the response to other treatment is not satisfactory. In chronic cases results are excellent."

Kracke (7) states that a recurrence was not observed in 9 years at the Emory University Hospital in a series of 23 patients after splenectomy.

Commenting on splenectomy, Downey (8) remarks: "Splenectomy is, therefore, not only a lifesaving but a curative measure in thrombocytopenic purpura which heretofore has been regarded as incurable and accompanied by a high mortality." He reports only one failure in a series of 36 cases (operation successful in 97.4 percent).

It is known that this disease is prone to develop remissions and that the course is so varied that adequate appraisal of any form of therapy will require extended observation. For this reason, both because of the size of the series and the prolonged observation of the cases reported by Elliott (4) it would appear that his findings approach a truer approximation of what one can expect from splenectomy. He reports a 27-year follow-up experience. In a total of 64 cases of idiopathic thrombocytopenic purpura there was a successful result in 69 percent following splenectomy. Breaking this down by age groups, it is found that splenectomy was successful in 95.1 percent of the patients under 31 years of age; results were successful in only 42.9 percent of the patients over age 31 years. The reason for the increased failures of splenectomy in those over 31 years of age is not known.



This difference is important in considering prognosis. Patients under 31 years of age have about a 95-percent chance of cure by splenectomy, whereas those 31 years of age and over have only about a 43-percent chance of cure by splenectomy.

The following is a case report of one patient with idiopathic thrombocytopenic purpura treated with splenectomy and toluidine blue.

### CASE REPORT

A 19-year old married white man first noted the onset of purpura of the skin, anorexia, and weakness in June 1947. He entered a naval hospital because of frequent occurrence of purpuric areas over his body, repeated moderate nasal hemorrhages, and splenomegaly. The spleen was barely palpable. There was no history of exposure to chemicals or drugs and no history of recent infection. A diagnosis of purpura hemorrhagica was made and on 17 July 1947 a splenectomy was performed. The postoperative course was uneventful. The hemorrhagic manifestations promptly ceased and on 5 September 1947 he went on convalescent leave.

The patient remained well until 15 September 1947 when he noted general malaise. The next day he noted chills and fever and 2 days later was admitted to this hospital.

*Physical examination*—Physical examination revealed a temperature of 102.8° F., pulse, 110; respiration, 28; blood pressure, 110/60. There was crusted blood about the nares. The mucous membranes were pale. Moderate-sized palpable lymph nodes were present in the neck, left axilla, and both inguinal regions. Examination of the lungs revealed dullness, decreased tactile and vocal fremitus, and decreased breath sounds in the left lower lobe. There were a few pin-point petechiae over the trunk.

*Roentgenographic examination*—A chest roentgenogram revealed diffuse mottling with a tendency to follow the bronchovascular markings.

*Laboratory findings*—Urine was negative. Peripheral blood. Red blood cell count, 2.8 million; hemoglobin 10 gm.; white blood cell count, 31,500. The differential blood count revealed myelocytes 2, juvenile cells 2, band forms 3, segmented neutrophils 55, lymphocytes 24, monocytes 4. There were 8 normoblasts per 100 white blood cells. Red cells showed moderate achromasia and anisocytosis. Platelets were too few for accurate count. Bleeding time, 14 minutes 20 seconds. Clotting time, 4 minutes 20 seconds. Clot retraction, 0 in 24 hours. Fragility test, normal. Blood Kahn test, negative. Prothrombin time, 95 percent of normal.

Blood chemistry values were within normal limits except for nonprotein nitrogen of 230 mg. per 100 cc. of blood.

Biopsy of sternal marrow revealed count shown in table 1.

*Treatment and hospital course*—The patient was treated with penicillin and frequent whole blood transfusions. Petechiae and ecchymoses recurred periodically. Moderate nasopharyngeal bleeding occurred intermittently. He made a slow recovery and on 15 November 1947 had a remission with cessation of his purpuric manifestations and evidence of normal lungs. His blood picture, both peripheral and sternal, remained essentially unchanged except for improvement in red blood cell count and hemoglobin.

TABLE 1.—Sternal marrow

Cell	Normal count <sup>1</sup>	Patient's count	Cell	Normal count <sup>1</sup>	Patient's count
Mycloblasts.....	0.3-5.0	0.4	Basophils.....	0.0-0.7	0
Promyelocytes.....	1.0-8.0	1.2	Lymphocytes.....	3.0-17.0	2.0
Myelocytes.....		5.5	Plasma.....	0-2.0	0
			Monocytes.....	5-5.0	0
			Reticulum.....	2-2.0	0
			Megakaryocytes.....	3-3.0	4
		7.9	Pronormoblasts.....	1.0-8.0	3.4
		61.0	Normoblasts.....	7.0-32.0	14.6
		6			

<sup>1</sup> See reference (9)<sup>2</sup> Total.

During this remission adrenalin 1:1000 was used as a diagnostic test to determine the presence of an accessory spleen. Before adrenalin was given, the blood cell count was 4.1 million and the platelets 4,170 per cu. mm.; after the administration of 0.4 cc. of adrenalin, the red blood cell count was 4 million and the platelets 48,000 per cu. mm.

The patient remained asymptomatic until 3 January 1948 when he had hematuria, epistaxis, and slight bleeding from the throat and tongue. He received frequent whole blood transfusions. On 2 February 1948 he had severe frontal and temporal headaches assumed to be due to intracranial hemorrhage. At this time his entire body was covered with petechiae. Transfusions were without apparent effect. Toluidine blue, 2 milligrams per kilo body weight, was given intravenously with no effect on the hemorrhagic manifestations. He died 24 hours later. The body was not discolored by use of the dye.

*Post-mortem examination*—Autopsy revealed extensive hemorrhage throughout the body. The entire body was covered with multiple petechiae. The nares, mouth, gums, and tongue revealed areas of hemorrhage. There was a recent hemorrhage in the left occipital area and an old hemorrhage in the right posterior frontal region of the brain. The lower lobe of the left lung revealed fairly large areas of hemorrhage. The entire gastrointestinal tract was hemorrhagic. There was hemorrhage into the pelvis of the right kidney and massive hemorrhage from the bladder mucosa. No accessory spleen was found.

There was much to indicate that the lymph nodes had assumed the functions of the spleen. Grossly they were slightly enlarged and reddish purple in color. Microscopic sections revealed the capsule to be intact; the peripheral sinuses were filled with blood cells; the architecture of the lymph glands was preserved; and the lymph follicles showed some endothelial proliferation and hyperplasia of the germinal centers. Throughout the entire lymph node there was considerable red blood cell infiltration and a great number of eosinophils.

TABLE 2

	Spleen	Lymph nodes
Size.....	Normal or slightly enlarged	Slightly enlarged.
Color.....	Reddish purple	Reddish purple.
Architecture.....	Preserved	Preserved
		node.

<sup>1</sup> Megakaryocytes are few in number and may be missed unless diligently searched for.

The similarity between the spleen of idiopathic thrombocytopenic purpura as reported by Nickerson and Sunderland (5) and the lymph nodes of this patient who had a recurrence after splenectomy is graphically seen in table 2

#### TREATMENT WITH ANTIHEPARIN COMPOUNDS

Allen and coworkers (2) (10), in 1947, reported studies with toluidine blue and protamines in purpuras. They suggested there was an increase of heparinlike substances in the blood and that these agents rendered heparin inactive, thereby controlling capillary permeability. Toluidine blue was used in doses ranging from 1 to 4 mg per kilo body weight in 250 to 500 cc of physiologic salt solution given intravenously over a 2-hour period. Their patients usually responded in from 24 to 48 hours. In four of their patients acute or subacute leukemia was present and were thus secondary purpuras; in all they obtained beneficial results. In one of their patients idiopathic thrombocytopenic purpura showed a remission after receiving toluidine blue. After refusing further therapy the other patient with idiopathic purpura died.

Parkin and coworkers (11) reported one patient with idiopathic thrombocytopenic purpura treated with protamine sulfate and toluidine blue. Hemorrhagic phenomena continued in spite of administration of 120 mg. protamine sulfate over a period of 4 days and 312 mg of toluidine blue over an 11-day period. They thought this method of therapy was of no benefit in idiopathic thrombocytopenic purpura. Holoubeck et al (12) have reported their experiences with the use of toluidine blue in the treatment of purpura associated with thrombocytopenia. One of their patients met the criteria of idiopathic thrombocytopenic purpura, the case histories of two others indicated secondary purpura. The patient with idiopathic purpura failed to benefit from toluidine blue therapy. The two patients with secondary purpura promptly responded to toluidine blue. Holoubeck and his coworkers have done toluidine blue titrations on 30 patients with purpuric states associated with thrombocytopenia. In this series they have always found the test positive in leukemias. They believe proper selection of cases extremely important.

Our patient treated with toluidine blue received a single injection according to the method recommended by Allen and coworkers (10). He died within 24 hours. Toluidine blue was entirely without effect. After its use the hemorrhagic manifestations did not increase; neither was there any diminution in them. This form of therapy, even when combined with whole blood transfusions, did not prolong life nor did it appear to hasten death. The body was not discolored at time of death.

Antiheparin compounds appear to be of value in secondary purpuras. Their value in idiopathic thrombocytopenic purpura is questionable but they should be employed when more conservative methods of treatment fail to produce improvement. To properly evaluate this method of therapy a larger series of cases will be required. With an accurate test for hyperheparinemia (which can be performed by the average hospital laboratory) idiopathic thrombocytopenic purpura may be narrowed down still further.

Much more study of purpura is required. In time easily applied tests to determine the adequacy of all factors in blood coagulation may be found. The therapy of splenectomy still rests on an empirical basis.

#### DISCUSSION

All idiopathic purpuras do not respond to splenectomy. Some do not have accessory spleens. Splenectomy is not as successful as the literature indicates it to be. The operation still rests on an empirical basis and why some patients benefit and others do not is not known. Much further study is required to elucidate the problem of purpura.

A rise of the platelet count of 44,000 per cu. mm. after receiving 0.4 cc. of 1:1000 adrenalin is not a positive test for an accessory spleen.

Lahey (13) believes that if a purpura fails to respond to splenectomy there is either an accessory spleen or the case is not idiopathic purpura. Splenectomy failed to cure the case reported. No accessory spleen was found at autopsy. The case meets the criteria of idiopathic thrombocytopenic purpura. Failure of splenectomy may be due to blockage of platelets so that they are not released into the general circulation, to the reticulo-endothelial or lymphatic system assuming functions of the spleen, or to other as yet unrecognized cause. With the present knowledge perhaps it would be better to reclassify idiopathic purpuras cured by splenectomy as splenic purpura even though the operation still rests on an empirical basis.

The antiheparin compounds have been most successful in secondary purpuras. A reliable readily performed test for hyperheparinemia would put antiheparin therapy on a rational basis in all purpuras. It failed to benefit the case reported here.

In the case reported there is evidence to indicate the lymph glands had assumed the functions of the spleen.

#### REFERENCES

1. HUMBLE, J. G.: Mechanism of petechial hemorrhage formation. *Blood* 4: 69-75, 1949.
2. ALLEN, J. G., and JACOBSON, L. O.: Hyperheparinemia; cause of hemorrhagic syndrome associated with total body exposure to ionizing radiation. *Science* 105: 382-385, Apr. 11, 1947.

Routine laboratory studies were within normal limits. The basal metabolic rate was plus 50 on admission.

On transfer to the U. S. Naval Hospital, Seattle, Wash., he was treated with Lugol's solution; a subtotal thyroidectomy was done on 21 January 1946. The pathologic diagnosis was toxic nodular goiter.

The postoperative course was uneventful. He gained 30 pounds, regaining his normal weight. There was some regression of the exophthalmos as determined by exophthalmometric readings. Reported basal metabolic rates ranged from plus 6 to plus 9.

The patient was discharged May 1946, but was readmitted on 10 March 1947 to the U. S. Naval Hospital, Chelsea, Mass., because of difficulty in lid closure. There had been no recurrence of symptoms.



Figure 1.

Examination on this readmission revealed extreme exophthalmos with slight corneal edema. There was no other change in the physical findings except for the presence of bilateral circumscribed pretibial plaque-like tumors which had not been previously noted. These lesions were firm, discrete, plaque-like ovoid masses which moved with the skin on palpation. The masses seemed to be definitely cutaneous. There was slight inflammation of the overlying skin and "pig-skin" dimpling was evident. The lesions were located in the middle third of the pretibial areas (fig. 1). The right lesion measured 6 cm. longitudinally by 5 cm.; the left 9 cm. by 6 cm.

These masses were first noted by the patient in May 1946. They were bilateral then and had enlarged rapidly to their present size. There were no symptoms referable to the lesions.

Routine laboratory studies were negative. Blood cholesterol was 208

mg. per 100 cc., basal metabolic rate was minus 4.

A consultant considered the lesions to be bilateral circumscribed pretibial myxedema. A specimen for biopsy from the left pretibial lesion was removed in March 1947. On incision, a glistening, gelatinous fluid oozed from the wound. Microscopic sections revealed a splitting of the connective tissue of the corium. The epidermis was normal, and there was no evidence of inflammation. The interstitial substance was identified as "mucin."

The course during this second hospitalization was uneventful. There was no change in the appearance of the pretibial lesions. The patient was discharged in April 1947. Subsequent follow up has not been possible.

#### DISCUSSION

The importance of the syndrome rests mainly on its rarity and on the fact that the myxedema is consistently pretibial and bilateral and occurs almost invariably in association with thyrotoxicosis.

Bilateral circumscribed pretibial myxedema was apparently not recognized clinically until Watson-William (3) reported the first case in 1895 and mentioned another case so recognized by Hektoen. Another case was reported in 1899 (4) but the condition was subsequently neglected in the literature until a report of a case by Richter (5) in 1927 revived interest. Since then a number of cases have been reported.

Bilateral circumscribed pretibial myxedema is of relatively rare occurrence; only 84 recognizable cases have been found in the literature. However, the incidence is considerably higher than might be supposed if one considers the number of cases unrecognized or unreported. Trotter and Eden (6) reported an incidence of 3 percent in their series of thyroid cases. Dunhill (7) noted a similar incidence.

Conclusions as to the age and sex distribution are impossible because the number of reported cases is too small to be of any statistical significance. There does not appear to be any particular frequency in any one age group as will be noted in table 1. It has not appeared before adolescence and only infrequently beyond the sixth decade. The oldest reported case was 71 years old (8). According to Trotter and Eden (6) there has been no correlation of the age distribution of circumscribed pretibial myxedema with that of thyrotoxic cases in general.

TABLE 1.—Age and sex distribution in 67 cases

Age (years)	Male	Female	Not recorded	Total
Under 20.....		1		1
20-29.....	4	4		8
30-39.....	5	11	1	17
40-49.....	6	13		19
50-59.....	5	6		11
60-69.....	2	6		8
Over 69.....	1	2		3
Not recorded.....				
Total.....	23	43	1	67

Approximately twice as many cases have been reported in women as in men.

Practically all the cases in which race was mentioned were in Caucasians although its occurrence in two Negroes (2) (9), one Chinese (10), and one Dravidian (11) has been reported.

Bilateral circumscribed pretibial myxedema was found closely associated with exophthalmic goiter. Diffuse toxic goiter existed in all reported cases except four in which toxic nodular goiter was present (10) (11) (12) (13).

#### PATHOLOGY

*Gross.*—The changes consist typically of bilateral anterolateral pretibial cutaneous ovoid plaques about 7 cm. in diameter in the lower

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#### PATHOLOGY

*Gross.*—The changes consist typically of bilateral anterolateral pretibial cutaneous ovoid plaques about 7 cm. in diameter in the lower



or middle thirds of the pretibial areas. Considerable variation in size has been reported with the areas of myxedema even extending to the feet or around the ankles. The involved skin has the characteristic "pigskin" dimpling of cutaneous edema although it may be roughly nodular. The skin may be slightly inflamed but not characteristically so. Exudates from incised areas give a positive stain reaction for "mucin."

*Microscopic.*—Microscopically the characteristic pathologic feature is a splitting or dissection of the connective tissue fibers of the corium with interstitial spaces filled with mucin. No inflammatory changes are ever evident and the epidermis is normal.

The pathology of pretibial myxedema has been more fully discussed by Pillsbury and Stokes (2)

The time of onset or discovery of the pretibial lesions in relation to the thyroid disease does not permit any conclusions. In a number of cases the lesions have appeared in the course of recurrent or residual thyrotoxicosis following thyroid surgery. Many of the cases have had the onset of pretibial lesions in an interval of 1 or 2 years after the appearance of thyrotoxicosis or after thyroidectomy. In the majority of cases there is a wide variation in onset—from 1 to 2 weeks (14) to over 10 years (13). Table 2 gives the time of onset of pretibial lesions in regard to the course of the thyroid disease.

TABLE 2—Onset of bilateral pretibial myxedema in 77 cases

Before the onset of thyrotoxicosis (13).....	1
Before treatment for thyrotoxicosis.....	34
After thyroidectomy.....	40
After high-voltage roentgen treatment of thyroid.....	2

Clinically the most striking feature is the unvarying occurrence of pretibial mucin deposition in association with recurrent, residual, or controlled exophthalmic goiter. These features are so characteristic that a clinical diagnosis can be readily made if one considers this syndrome among the diagnostic possibilities. Lymphedema and scleroderma must be considered in the differential diagnosis.

The lesions are rather indolent in their course. They are said to regress and disappear spontaneously over a period of years (2) (6) (7) (13) (14) (15).

As one would expect in an entity whose cause is unknown, treatment has been generally ineffective. Excision of the lesions was tried in one case with presumably a good permanent result (15). Local thyroxin (6) (16), thyroid extract (2) (6), radiant heat (17), iodine (2), and local thyroid implantation (18) have all been tried without apparent effect on the course.

## SUMMARY

1. Bilateral circumscribed pretibial myxedema is an uncommon and not very important clinical entity consisting of bilateral pretibial plaques of mucin deposits occurring in association with a thyrotoxic state, usually exophthalmic goiter. It usually appears in recurrent or residual thyrotoxicosis following surgery.

2. Age, sex, and race distribution and incidence cannot be positively stated because only 84 cases (a statistically insignificant number) have been reported in the literature.

3. The pathologic feature consists of localized cutaneous mucinous infiltration, microscopically identical with that of classical myxedema of hypothyroidism.

4. In typical cases the diagnosis is readily made clinically. The differential diagnosis includes lymphedema and scleroderma.

5. An additional typical case is reported.

## REFERENCES

1. KREIBICH, C.: Mucin bei Hautekrankung Arch f Dermat u Syph. 153: 799-803, 1927.
2. PILLSBURY, D. M., and STOKES, J. H.: Circumscribed myxedema of skin Arch Dermat. & Syph. 24: 255-270, Aug. 1931.
3. WATSON-WILLIAMS, P.: Case of Graves' disease with unilateral symptoms treated by thymus feeding. Clin. J. 7: 93, 1895.
4. MORROW, H.: Symmetrical areas of solid edema occurring in Graves' disease. Brit. J. Dermat. 40: 286, 1899.
5. RICHTER, W.: Ueber lokales myxödem der Haut, mit Beziehung zum Basedow. Dermat. Wehnschr. 84: 7 (Jan. 1), 51 (Jan. 8), 1927.
6. TROTTER, W. R., and EDEN, K. C.: Localized pretibial myxoedema in association with toxic goitre. Quart. J. Med. 11: 229-240, Oct. 1942.
7. DUNHILL, T. P.: Thyrotoxicosis; its surgical aspects. Brit. M. J. 2: 1034-1037, Nov. 30, 1935.
8. MARCHIONINI, A., and JAHN, D.: Elephantlastisches tuberoses Myxoedema circumscriptum bei Morbus Basedow. Ein Beitrag zur Endokrinopathologie der Haut. Arch. f. Dermat. u. Syph. 176: 694-704, 1938.
9. GAMMEL, J. A., and BENKLEY, G. W.: Circumscribed myxedema Arch. Dermat. & Syph. 31: 722, 1935.
10. SCHWARTZ, H. J., and MADDEFN, R. F.: Circumscribed myxedema; report of 2 cases. Arch. Dermat. & Syph. 43: 375-380, Feb. 1941.
11. PARFKEH, J. G.: Localized pretibial "myxoedema" in thyrotoxicosis. Indian M. Gaz. 79: 20-22, Jan. 1944.
12. VON HERT-ELERA, M.: Myxoedema circumscriptum symmetricum bei Thyrotoxiikose. Klin. Wehnschr. 16: 267-270, Feb. 20, 1937.
13. NETHERTON, D. W., and MURPHY, B. E.: Circumscribed myxedema. J. A. M. A. 104: 1492-1496, Apr. 27, 1935.
14. WATSON, D. M.: Localized (pretibial) myxoedema associated with Graves' disease. Canad. M. A. J. 54: 260-265, Mar. 1946.
15. O'LEARY, P. A.: Localized solid edema of extremities in association with exophthalmic goiter. Arch. Dermat. & Syph. 21: 57-70, Jan. 1930.

- 16 GOLDNER, M.: Basedow mit lokalisiertem myxodem. *Ztschr f. Klin Med* 114: 481-489, 1930
17. CAROL, W. L. L.: Über atypisches Myxodem. *Acta dermat -venereol* 13: 127-149, May 1932
- 18 SAMER, J.: Über zirkumskriptes Myxodem. *Dermat Wchnschr* 87: 1607-1612, Oct. 13, 1928



# Syndrome of Circumoral Pigmentation Associated With Generalized Intestinal Polyposis

## Report of a Case

BEN F. PERRY, *Lieutenant, Junior grade (MC) U. S. N.*<sup>1</sup>

JOSEPH J. ZUSKA, *Commander (MC) U. S. N.*<sup>1</sup>

HUTCHINSON (1) in 1896 published a report of identical twins who both presented a peculiar pigmentation about the mouth, a fact which was then regarded as a dermatologic curiosity.

Weber (2) in 1919 recorded the death of one of these twins from intussusception. Although there was no post-mortem confirmation of intestinal polyposis, it seems likely that these twins suffered from the syndrome to be discussed.

Peutz (3) in 1921 described a singular family, several members of which showed a strongly suspected or proved generalized intestinal polyposis associated with pigmentation of the mouth, hands, and feet. Because three generations of this family had intestinal polyps and skin pigmentation a definite familial trend of the disease was apparent. Peutz was the first to report this syndrome.

Van Dijk and Oudendal (4) reported the cases of a brother and sister who underwent surgical exploration because of repeated episodes of severe colic; intussusception of the ileum secondary to small bowel adenomas was found. It is to be noted that both the brother and sister had pigmentation of the lips present from birth, similar to that noted in our case.

Foster (5) in 1944 published the cases of a father and daughter who suffered from single small bowel polyps complicated by intussusception; they also showed characteristic circumoral pigmentation. The father's brother who also had similar lip and facial pigmenta-

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Figure 3.—Barium enema contrast study showing the presence of a large polyp in the descending colon

On admission to this hospital the patient appeared to be normal, well nourished, and well-developed. There was slight inflammation of the pharynx and a post-nasal drip. The mucous membrane of the lower lip was diffusely mottled with dark grayish black pigment deposited in patches of varying size (fig 2). These lesions were not elevated. On the skin about the lips there were a lesser number of similar lesions, some slightly elevated. In addition a few pigmented areas were present on the upper lip and some were also present on the oral mucosa. The temperature was 99° F; the blood pressure 110/70, and the pulse, 82.

Laboratory examination showed red blood cell count, 4,100,000, hemoglobin, 11 gm; white blood cell count 5,700.

On 8 August 1949, a barium enema contrast study showed a polyp, measuring 17×20 mm, in the lower descending colon (fig 3).

On 11 August 1949 a laparotomy was done and a large polyp was excised through an incision in the sigmoid colon. Pathologic examination revealed a benign pedunculated adenomatous polyp measuring 1.5×2.0 cm (fig 4).

The postoperative course was uneventful and the boy was discharged on 20 August 1949.

studies and a proctoscopic examination. When he was between the ages of 7 and 8 years, five or six new rectal polyps were discovered and excised. Again, at the age of 8, another rectal polyp was fulgurated. The patient had no more difficulty until July 1949 when a large polyp of the colon above the rectosigmoid level was revealed by roentgenogram. This necessitated hospitalization and brought the case to our attention. It should be emphasized that the original diagnosis of small bowel polyposis was not made for a period of 5 years after the onset of symptoms, even though the characteristic pigmentation was present from birth. This pigmentation had been noted by a number of physicians who, however, were unaware of its significance.

The family history was entirely negative for gastrointestinal symptoms except for "hemorrhoids" in three persons of the paternal line.



Figure 4.—Section of polyp removed in 1949. (Low magnification)

## SUMMARY AND CONCLUSIONS

A case of small and large bowel polyposis associated with a characteristic pattern of circumoral pigmentation is presented. This case is probably a sporadic instance of a syndrome which is usually clearly hereditary and transmitted as a simple mendelian dominant.

This syndrome is not generally appreciated, and when pigmentation of the type described is seen, small and large bowel polyps should be diligently searched for by roentgen studies of the gastrointestinal tract and by sigmoidoscopic examination.

When symptoms of abdominal colic or intestinal obstruction occur in a patient with this distinctive type of circumoral pigmentation, generalized intestinal polyposis should be suspected.

## REFERENCES

1. HURCHINSON, J.: Pigmentation of lips and mouth. *Arch. Surg. (London)* 7: 290, 1896.
2. WENF, F. P.: Patches of deep pigmentation of oral mucous membrane not connected with Addison's disease. *Quart. J. Med.* 12: 404, July 1919.
3. PEUTZ, J. L. A.: Very remarkable case of familial polyposis of mucous membrane of intestinal tract and nasopharynx accompanied by peculiar pigmentation of skin and mucous membrane. *Nederl. maandschr. v. Geneesk.* 10: 134-146, 1921.
4. VAN DIJK, J. A., and OUDENDAL, A. J. F.: Adenomas responsible for intestinal invagination. *Nederl. Tijdschr. v. Geneesk.* 1: 966-973, Feb. 28, 1925.
5. FOSTER, D. B. E.: Adenocarcinoma of small intestine in father and daughter. *Brit. M. J.* 2: 78-79, July 15, 1944.
6. TOURAINE, A., and COUDER, F.: Syndrome de Peutz (lentigino polypose-digestive). *Ann. de dermat. et syph.* 5: 313, 1945.
7. TOURAINE, A., and COUDER, F.: Lentiginose péri-orificelle et polypose viscérale. *Presse méd.* 51: 405-406, June 22, 1946.
8. JEGHERS, H.: Medical progress; pigmentation of skin. *New England J. Med.* 231: 88, July 20, 1944; 122, July 27, 1944; 181, Aug. 3, 1944.
9. JEGHERS, H.; MCKUSICK, V. A.; and KATZ, K. H.: Generalized intestinal polyposis and melanin spots of the oral mucosa, lips, and digits: a syndrome of diagnostic significance. *New England J. Med.* 241: 993-1005 and 1031-1036, Dec. 1949.



Following this treatment, epithelialization of the margins with advancement centripetally occurred, leaving a thin, smooth pale, sharply demarcated scar (fig 2). There was no evidence of *C diphtheriae* in the scars up to 1 month after healing. A moderately severe polyneuritis occurred 3 months after the onset of the cutaneous ulcers. This was manifested by paresthesia of the fingers and toes, fine digital tremors, general weakness, muscular fibrillary twitchings, hyperesthesia, hypesthesia, decreased vibratory sense, and a spinal fluid protein of 60 mg per 100 cc. A high-caloric, high-protein, high-carbohydrate diet with supplemental vitamin therapy was prescribed. His response was slow, but persistent. There was no known history of exposure to cutaneous or nasopharyngeal diphtheria.

### DISCUSSION

Multiple lesions, as seen in our patient, are reported in 75 percent of the cases of cutaneous diphtheria. Unhealed, indolent ulcers that are severely painful soon after onset but show hypesthesia and anesthesia of the base, margin, and surrounding periphery of the ulcer 3 to 5 weeks after the onset, suggest the diagnosis of cutaneous diphtheria (2). In this case, the presence of severe pain in the ulcers about 8 weeks after the onset conflicts with this diagnostic criterion. The diphtheritic infection in this patient may not have occurred at the time of onset of the ulcerations of the skin, but may have been superimposed several weeks later. If this were true, the nature of the original ulcerations would remain obscure. Myocarditis, proportionate to the severity of the diphtheritic infection and occasionally fatal, occurs 4 to 7 weeks after the onset in a small percent of cases. Our patient showed no evidence of myocardial involvement.

### SUMMARY

A case of cutaneous diphtheria that occurred within the United States, and conformed to the current descriptions of cutaneous diphtheria was complicated by a polyneuritis. The patient responded favorably to local cleansing measures, bed rest, and diphtheria antitoxin. Penicillin was without effect. Indolent ulcers necessitate consideration of the diagnosis of cutaneous diphtheria, even in non-tropical and non-desert climates.

### REFERENCES

1. LITROW, A. A., MACLEAN, D. D., BUMSTEAD, J. H., and WELT, L. G.: Tropical ulcers and cutaneous diphtheria. *Arch Int Med* 78: 255-297, Sept 1946.
2. LIVINGOOD, C. S., PERBY, D. J., and FORRESTER, J. S.: Cutaneous diphtheria: report of 140 cases. *J Invest Dermat* 7: 341-361, Dec 1946.



# Glanders

RALPH W. MENDELSON, *Lieutenant Colonel U. S. A. F. (MC)*

**G**LANDERS, an acute infectious disease of equines caused by *Malleomyces mallei*, is characterized by ulcerating granulomatous lesions of the skin, subcutaneous tissues, and mucous membranes. The acute cases may become chronic and the chronic cases exhibit acute exacerbations.

In humans it is frequently fatal and often difficult to diagnose unless one is cognizant of the disease when dealing with ulcerating, granulomatous lesions of the skin and/or mucous membranes. The protean manifestations in both the acute and chronic stages may suggest a number of clinical conditions and valuable time may be lost in protecting contacts if a patient with this condition is undiagnosed and thus permitted to spread the infection.

A positive diagnosis cannot be made on clinical findings alone. A history of contact with horses, mules, or donkeys is highly suggestive in a patient exhibiting an ulcerative, granulomatous lesion, particularly of the nose. Syphilis, tuberculosis, epithelioma, and/or a variety of other diseases including granuloma inguinale, lymphogranuloma inguinale, and mycotic lesions must be ruled out.

The following cases were collected by the author and portray the chronic type of lesion. Each patient gave a history of contact with either horses or donkeys. The diagnoses were confirmed bacteriologically. Because of the virulence of the organism it is not advisable to work with cultures except under the most meticulous bacteriologic technique.

## CASE REPORTS

*Case 1.*—A 36 year-old white woman with lesions as shown in figure 1 presented herself for treatment. The past history was irrelevant except for the fact that she had been living on a farm and had been in daily contact with two horses that had died of an unknown disease. She had been treated for a variety of conditions without results. Except for the presenting condition, physical examination was negative. Smears from the nasal discharge and from the ulcers revealed an infection with a gram-negative, slightly curved rod that proved to be



and lips with the formation of extensive scar tissue and deformity. Nasal obstruction was complete (fig 6). There was considerable bilateral adenopathy, but no glandular necrosis. An organism that proved to be *M. mallei* was obtained from the nasal ulcerations; this patient's serum also agglutinated *M. mallei* in very high dilutions.

#### DISCUSSION

The past history in all of these cases reveals that each patient had been in close daily contact with either horses or donkeys and that in every case except one, the animals had died of some unknown disease.

Clinically the lesions may be confused with a variety of conditions. The author has observed, in the tropics, early gangosa that simulated glanders.

The prognosis is not good; the author knows of no specific treatment. Vaccine treatment in case 2 appeared to be of value but one should be cautious in pronouncing a cure as latency is characteristic of the disease.

The nasal passages appear to be the portal of entry for the infection although in one of our cases the eye was apparently the site of the primary lesion.



# Foot-and-Mouth Disease in Mexico

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THE most serious threat to our cattle today is foot-and-mouth disease, now prevalent in Mexico. Our animal population has suffered from 10 previous outbreaks, the first in 1870 and the latest in 1932. Aside from the present outbreak in Mexico, the cattlemen in Europe, Asia, Japan, Africa, and South and Central America have contended with this malady for many years.

In Mexico the mortality from this disease has been low. In outbreaks in other countries, the animal populations have been more seriously affected. Lesions are usually confined to the mouth, hoof, and udder. After an incubation period of from 18 hours to 1 week, vesicles, that later rupture, appear in the mouth, in the cleft of the hoof, or on the udder. If the tongue is involved there is usually complete loss of the lingual epithelium. However, the stratum germinativum is not affected, perhaps accounting for the rapid recovery in cases without secondary involvement. In many cases infection of the hoofs has been followed by a secondary invasion with *Actinomyces necrophorus*, producing serious lameness.

An outbreak of the disease results in severe economic losses. Milk production is seriously affected in all types of dairy cattle. This disease is highly infective and spreads to entire herds and over large areas. There is no other known disease of animals whose infectivity is greater. An example is the milk shed of Mexico City where at least 50 percent of all dairies were infected. Beef cattle suffer great loss of weight, and may abort. All cloven-hoofed animals—cattle, sheep, swine, and goats—are susceptible. Horses are not affected and there have been no cases in wildlife reported in Mexico.

There are at least three types of foot-and-mouth disease virus—A and O (from the villages of Ardennes and Oise in France where these types were originally isolated) and C. Until recently only type A

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# Bony Lesions Occurring During The Early Stages of Syphilis

## Report of a Case

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EVERY physician is familiar with the fact that lesions of the skeletal system, especially destructive osseous lesions, occur during the tertiary stage of syphilis. That this should be true is a little difficult to understand since it is a well known fact that very early in the course of the disease vast numbers of *Treponema pallidum* are widely distributed throughout the entire body, and every tissue in the body harbors the organism (1) (2)

In 1942, Reynolds and Wasserman (2) reviewed the literature and found that 15 cases had been reported. In addition to these, they reported 15 additional cases taken from 10,000 cases which had been observed in the syphilis division of the medical clinic and on the wards of the Johns Hopkins Hospital over a 22-year period (1918 to 1940). Review of the available literature today reveals that theirs is probably the most extensive study of this particular manifestation of the disease which has been made. As early as 1916, Wile and Senear (3), in a study of the involvement of the bones and joints in early syphilis, reported that 60 (36 percent) out of 165 patients with signs of either primary or secondary syphilis also showed signs of bone or joint involvement. Their rather extensive study was completed without the aid of roentgenologic examinations, except in the suspicious cases, and it is entirely possible that a higher percentage would have been discovered had roentgenograms of the bony skeleton been available in all cases. Bloom (4), in June 1934, reported a case of destructive osteitis and facial paralysis in secondary syphilis. His patient apparently had no symptoms referable to the skeletal system until after antiluetic therapy was instituted. Following two injections of bis-

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mouth and one injection of neoarsphenamine the patient had pain in the left acromioclavicular articulation over which appeared a tender swelling, and pain on motion of the arm. Roentgenograms showed a destructive lesion in the outer end of the left clavicle. After further antiluetic treatment, healing was demonstrated. Squires and Weiner (5), in 1939, reported a case of osteitis of the skull in early syphilis. They stressed that bone involvement would be discovered more often if roentgenograms were made when patients with early syphilis complained of headache. Newman and Saunders (6), in 1938, reported multiple areas of destruction of the inner and outer tables of the skull in a case of secondary syphilis. They stated that osseous lesions of early congenital syphilis were analogous to those of early acquired syphilis. Every student of syphilology is acquainted with the fact that skeletal involvement is fairly common as a relatively early sign in congenital syphilis. Mandelbaum and Saperstein (7), in 1936, reported a case of acute gummatous osteomyelitis of the skull and the sternum 8 weeks after blood transfusion. Pian and Frazier (8) reported a similar case in 1940. Thompson, Leedham, and Hailey (10), in 1949, reported two cases of osteomyelitis of the skull occurring during early syphilis, each one occurring during the secondary stage of the disease. They felt that trauma might have played a part in determining the location and the subsequent destructive course of the bone lesions. One of their cases also showed a periostitis of each tibia, and the other showed a similar involvement of the right humerus. Interestingly enough, one of these patients was admitted to the hospital for a fracture of the second cervical vertebra, but never showed signs of luetic involvement in this location. The case reported in this article did not give a history of trauma. Likewise, the majority of cases reported in the literature to date have failed to give a history of trauma.

It seems to be almost universally agreed that more cases would be discovered if careful physical examination and roentgenologic examination of the skeletal system were done in all cases of early syphilis. Patients frequently complain of headache during the early weeks of the disease; however, roentgenographic studies are seldom done, unless the patient complains of severe pain. Then, too, because of the dearth of literature regarding this condition it is probable that few physicians are well acquainted with the fact that organic bone lesions, periostitis, arthralgia, arthritis, osteoperiostitis, or osteomyelitis of various parts of the skeletal system can occur during the early weeks or months following the introduction of the causal organism into the body. According to Pancost, Pendergass, and Schaeffer (11), luetic invasion of the calvaria is generally limited to the anterior and lateral portions of the skull, extension being halted by the lambdoid suture.

Destructive gummatous lesions of the skull, the central portion of the face, the tibia, the sternoclavicular region, and the shoulder girdle, occurring years after the primary lesion, are well known to everyone

### CLINICAL FINDINGS AND DIAGNOSIS

The diagnosis of destructive bone lesions in early syphilis depends upon an accurately taken history, careful physical examination, and skillfully interpreted roentgenograms. The serologic test is practically always positive. The most frequent lesion seen is a proliferative periostitis of the tibia. Other types of involvement are ostealgia, osteitis, osteoperiostitis and osteomyelitis. Arthralgia and arthritis may accompany the process. The bones most frequently involved in the destructive type of lesions are those of the skull. Pancost, Pendergass, and Schaeffer (11) make the startling statement that few individuals infected with syphilis escape some skull involvement, but, due to lack of symptoms referable to the head, the skull is not often studied. However, any bone in the body might be involved in one of the above-named processes. The most frequent symptoms are pain and swelling at the site of involvement. According to some observers, the pain is worse at night, but, according to others nocturnal pain has been unduly overstressed. Some observers state that for some unknown reason the pain seems to be worse while the patient is in the reclining position. This is questionable. The fact that the patient complains more of pain at night while in the reclining position is possibly due to the fact that his attention is more likely to be attracted to his condition when his mind is relieved of the daily distractions. The patient reported in this article did state that his pain was worse at night. In discussing syphilitic periostitis, Stokes, Beerman, and Ingraham (9) state

Early syphilitic periostitis, clinically, is a sharply localized process seldom covering more than a few square centimeters and presenting as a somewhat doughy elevation on the bone, noninflammatory, without any sign of fluctuation \* \* \* Its most distinctive feature is the highly localized point of exquisite tenderness which can be found by searching the entire surface of the tumefaction with the fingertip

Any sign or symptom of secondary syphilis might accompany these osseous lesions. Bone lesions may occur anywhere from 6 weeks after the primary lesion to 14 months after the appearance of the secondary lesions (2). Several cases have been reported in which rather marked systemic symptoms occurred, including chills and fever, malaise, anemia, weakness, and loss of weight.

### ROENTGENOLOGY

According to Stokes, Beerman, and Ingraham (9), the importance of skilled interpretation of the roentgenogram is second only to rou-

tine serologic tests for syphilis in establishing the diagnosis of skeletal syphilis. It is agreed that syphilis is primarily a constructive or osteoplastic process. According to Stokes et al. (9), preponderantly constructive bone lesions are usually due to osteomyelitis or syphilis and preponderantly destructive lesions are usually tuberculous or malignant. They also state:

The chief exception to the constructive or productive rule in syphilis is in the case of the cranial bones, in which the ultimate destructive process without reconstruction, leaves the diagnosis suspended between syphilis and malignancy. Since primary malignancy of the cranial bones is uncommon, it follows that a destructive process in the cranial bones is, in the absence of primary malignant focus elsewhere, almost surely of syphilitic origin, especially in a patient of precancerous age.

### TREATMENT

The response to treatment is usually satisfactory and the reversal of the serologic test for syphilis is brought about. According to Reynolds and Wasserman (2), two of their cases apparently were extremely resistant to treatment, but eventually responded after extensive and heroic treatment, including fever therapy and passive arsenical treatment. The Herxheimer phenomenon may occur.

### PATHOLOGY

Is this particular lesion to be considered a gumma? The answer has to be yes and no. If one adheres to the definition of a gumma, namely, "a soft gummy tumor occurring in tertiary syphilis and made up of tissue resembling granulation tissue," then the answer is "No." However, histologically this lesion is one of bone destruction with round cell infiltration most marked about the blood vessels. In one of the cases reported by Reynolds and Wasserman, a biopsy was done, and a more or less characteristic histologic picture of gumma was noted.

### CASE REPORT

A well-developed, well-nourished 21-year-old white man was first seen on 20 April 1948 complaining of pain and left-sided headache of about 4 weeks' duration. Coincident with the onset of pain, he became aware of a small, tender swelling over the left frontal region. Roentgenograms of the skull then showed an area of bony destruction, measuring 2 cm. in diameter, located in the left frontal bone just anterior to the frontoparietal suture. A provisional diagnosis of neoplasm of the skull was made and the patient was transferred to a hospital ship on the same day. There physical examination showed: a tender swelling measuring approximately 4×2.5 cm., over the left frontal region and slightly elevated above the surface of the skull; a faint macular rash over the upper anterior thorax; and enlarged, nontender, discrete lymph nodes in the posterior cervical, preauricular, post-auricular, and axillary groups.

*Physical examination in hospital*—The patient was later transferred to a naval hospital where the history and physical findings were essentially as given

above except that no rash was noted over the upper anterior thorax as previously described.

*Past history*—According to the record and his story, in December 1947 the patient was treated for gonorrhea with 400,000 units of penicillin, his urethral discharge did not disappear entirely until 10 to 12 days after penicillin therapy had been completed. The patient stated that a blood Kahn test, 3 months after discontinuance of penicillin therapy for gonorrhea, was reported as negative.

*Laboratory examination*—All laboratory studies, including tests for Dence-Jones protein, blood calcium, serum phosphorus, and serum phosphatase, and the tuberculin test were negative. Blood Kahn test, 3+ Spinal fluid examina-

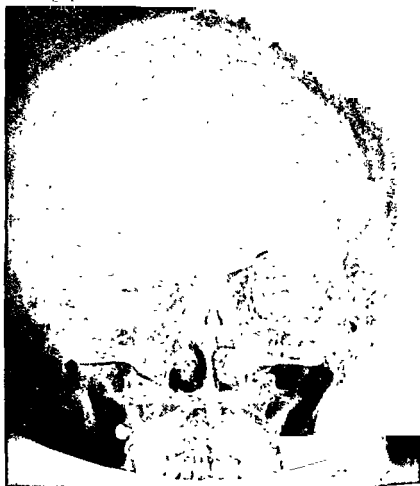


Figure 1.—Anteroposterior appearance of skull before treatment (5 May 1948)



Figure 2.—Lateral appearance of skull before treatment (5 May 1948).

tion, normal. Complete urologic study and eyeground examination revealed no abnormalities.

*Stereoscopic and roentgenographic examinations*—Stereoscopic examination of the skull showed an area of bone destruction measuring approximately 3 cm in diameter and involving both the inner and outer tables of the left frontal bone just anterior to the left frontoparietal suture. Within the center of this rarefied area there was a zone of normal bone density measuring about 1 cm in diameter (figs. 1 and 2). Roentgenograms of other bones and of the chest were negative.

*Differential diagnosis*—The following conditions were considered in the differential diagnosis: Primary bone neoplasm; metastatic neoplasm, with the primary focus in some other part of the body; hemangio-endothelioma; eosinophilic granuloma; osteomyelitis, pyogenic; luetic osteomyelitis; Hand-Schüller-Christian disease; xanthomatosis; osteitis fibrosa cystica; Hodgkin's disease; and leukemic infiltration.

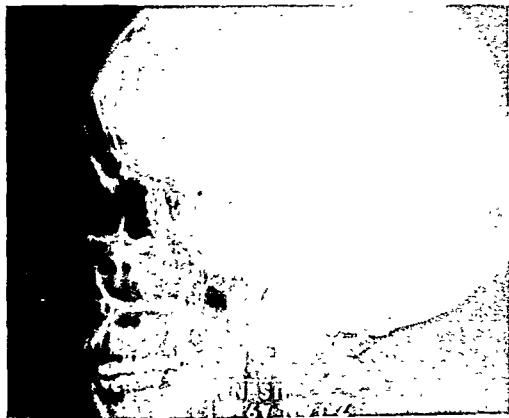
*Darkfield examination*.—It was considered that if the generalized adenopathy was luetic in origin, spirochaetes would more than likely be found in the lymph nodes. A lymph node was excised and a scraping, taken from the cut surface, on darkfield examination showed numerous spirochaetes and the typical moron darkfield examination showed numerous spirochaetes and the typical morphology and motility of *Treponema pallidum* were observed. The destructive bone process, therefore, was considered to be luetic in origin, occurring in the early stages of syphilis.



*Treatment.*—Antiluetic therapy was instituted and the patient received the following treatment. From 15 May 1948 to 30 May 1949, penicillin, 10,000,000 units. From 15 May 1948 to 15 January 1949, mapharsen, 25 injections (total of 1.44 gm.), and bismuth subsalicylate in oil, 25 injections (a total of 3.25 gm.) were given. Simultaneously potassium iodide, 30 drops 3 times a day, was given and continued for 3 months. Additional arsenical and heavy metal therapy were given because (a) skeletal syphilis is generally considered to be one of the more difficult forms of the disease to eradicate and (b) because it would not have been possible to adequately follow the case to determine whether a cure would have been accomplished with penicillin alone.



Figure 3.—Anteroposterior appearance of skull on 7 January 1949 after completion of antiluetic treatment.



*Figure 4.—Lateral appearance of skull on 7 January 1949 after completion of antiluetic treatment.*

Healing of the destructive process occurred approximately 8 months after beginning antiluetic therapy (figs. 3 and 4). The blood Kahn test was reported negative December 1948, 7 months after antiluetic therapy was started.

#### DISCUSSION

The patient's blood Kahn test was negative when he entered the service in September 1945. In December 1947, he had gonorrhea which was treated with 400,000 units of penicillin—adequate therapy for the majority of cases of gonorrhea, but certainly inadequate for early syphilis although perhaps enough penicillin was given to mask the development of full-blown secondary syphilis. Since his urethral discharge did not clear up for 10 to 12 days following therapy for gonorrhea, that probably was indicative of the presence of an intra-urethral chancre at that time. The macular rash over the upper anterior thorax before his admission to the hospital could easily have been an abortive secondary eruption.

#### SUMMARY AND CONCLUSIONS

A case of destructive syphilitic osteomyelitis of the skull occurring during the early stages of the disease is reported. A review of the literature shows that surprisingly few cases of this particular mani-

festation of the disease have been reported. Experts in the field have stated that more cases would probably be discovered if more careful physical examinations and roentgenologic studies were done during the early stages of the disease.

It has been suggested that bone involvement in early acquired syphilis is analogous to skeletal lesions commonly observed in the congenital form of the disease.

A very useful and practical method of making the diagnosis of syphilis is by lymph node aspiration or by lymph node excision and darkfield examination of the lymph node juice. This is especially true when skin or mucous membrane lesions are absent.

A plea is once more made to physicians who are charged with the responsibility of treating gonorrhea with penicillin to adequately follow such patients for a sufficient time, at frequent intervals, by physical examination and blood tests to rule out the possibility of a simultaneous luetic infection. Monthly physical examination and blood tests for at least 6 months after the completion of penicillin treatment of gonorrhea is considered necessary.

#### REFERENCES

1. NEISSEK, A. *Beiträge zur Pathologie und Therapie der Syphilis*. Julius Springer, Berlin, 1911. p. 101.
2. REYNOLDS, F. W. and WASSERMAN, H. Destructive osseous lesions in early syphilis. *Arch. Int. Med.* 69: 263-276, Feb. 1942.
3. WILE, U. J., and SENEAR, F. E. Study of the involvement of the bone joints in early syphilis. *Am. J. M. Sc.* 152: 689, Nov. 16, 1916.
4. BLOOM, D. Destructive osteitis and facial paralysis in secondary syphilis (Society Transactions section). *Arch. Dermat. & Syph.* 29: 940-941, June 1934.
5. SQUIRRES, J. B., and WEINER, A. L. Osteitis in early syphilis; report of case. *Arch. Dermat. & Syph.* 39: 830-835, May 1939.
6. NEWMAN, B. A. and SAUNDERS, H. C. Skeletal system manifestations during secondary syphilis. *New York State J. Med.* 33: 768-795, May 15, 1938.
7. MANDELBAUM, H., and SAPERSTEIN, A. N. Transmission of syphilis by blood transfusion: case of acute gummatous osteomyelitis. *J. A. M. A.* 106: 1061-1063, Mar. 28, 1936.
8. PIAN, H. C. and FRAZIER, C. N. Transfusion of syphilis with widespread osteomyelitis and cutaneous lesions of erythema multiforme type. *Chinese M. J.* 57: 301-317, Apr. 1940.
9. STOKES, J. H., BEYERMAN, H., INGRAHAM, N. R., JR. *Modern Clinical Syphilology*. 3d edition. W. B. Saunders Co., Philadelphia, Pa. 1944. pp. 601, 774, and 775.
10. THOMPSON, R. G.; LUEDHAM, C. L., and HARTY, H. Osteomyelitis of skull in early syphilis. *American Journal of Syphilis, Gonorrhea, and Venereal Disease*. Jan. 1949.
11. PANCOST, PENDERGASS, SCHAEFFER. *The Head and Neck in Roentgen Diagnosis*. Charles C. Thomas, Baltimore, Md.

# Fractures of the Mandibular Condyle

## Report of Eight Cases

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**F**RACTURES of the mandibular condyle are not so common as those which occur in other parts of the mandible. However, they are not so rare as was believed at one time. Their greater frequency may be attributed, at least in part, to the increased occurrence of automobile and industrial accidents. Furthermore, the better roentgenographic equipment and techniques now used show these fractures more clearly. Clinical statistics show that about 8 percent of mandibular fractures occur at the condyle.

### ANATOMIC CONSIDERATION

The temporomandibular joint is complicated in that it is made up of the roller-shaped head of the condyle, the interarticular disk, known as the meniscus, and the mandibular or glenoid fossa. The fossa is bounded anteriorly by the articular eminence, and posteriorly by the postglenoid tubercle. The wall of the temporomandibular joint is a loose, thin capsule which surrounds the cartilaginous articular portion of the mandibular fossa and articular tubercle, and inserts in the area of the upper condylar neck. The joint cavity is divided into two chambers by a specialized disk of fibrocartilage which unites peripherally with the capsule and anteriorly with the insertion of the external pterygoid muscle. Laterally, the joint capsule is reinforced by the heavy bands of the temporomandibular ligament extending posteriorly and inferiorly from the zygomatic arch to the lateral and posterior surface of the condylar neck.

The slinglike action of this ligament is important in normal joint function. Medially, the capsule is thin and not well-supported. Rupture at this site with medial dislocation of the condylar head is frequently seen in fracture of the condyle. The stylomandibular and

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sphenomandibular ligaments are of less importance; they aid in maintaining the mandible in place when a fracture occurs. Overriding of the fragments frequently follows condylar fractures. This condition results from the powerful upward contraction of the masseter, internal pterygoid, and temporal muscles. The external pterygoid muscle plays an important role in the displacement that occurs in condylar fractures. This muscle has its insertion in the neck of the condyle and because of its anterior pull tends to displace condylar fractures anteriorly. Some of the superficial structures in proximity to the condylar process are the parotid gland, auriculotemporal nerve, superficial temporal vessels, and branches of the facial nerve. The internal maxillary artery and pterygoid venous plexus are important structures deep to the condyle.

#### CLASSIFICATION

Condylar fractures have been classified by Thoma (1) as follows:

1. Fractures without displacement.
2. Fractures with displacement.
3. Fractures with overriding of the fragments.
4. Fracture dislocations (medial or lateral).
  - a. Intracapsular fracture dislocations (subluxation).
  - b. Complete fracture dislocation.
  - c. Fracture dislocation with complete dislodgment of the condyle.
  - d. Dislocation of part of the head of the condyle.
5. Fracture dislocation in forward direction.
6. Fracture dislocations with displacement of the meniscus.
7. Comminuted condylar fractures.
8. Old condylar fractures with deformity.

#### ETIOLOGY

The cause is direct or indirect external violence. The fracture usually occurs as a result of a blow on the chin. If the blow is on the side of the chin, the opposite condyle is usually involved. In bilateral fractures, the blow is often on the point of the chin.

#### CLINICAL FINDINGS AND DIAGNOSIS

The clinical signs of fracture of the mandibular condyle may be scarcely perceptible and symptoms may be negligible or absent. Frequently the roentgenogram gives the first evidence of a condylar fracture. Varying combinations of signs and symptoms may be present, and there is no correlation between the extent of fragment displacement and the magnitude of clinical deformity. In spite of the displacement seen in roentgenograms, there may be no occlusal im-

balance or functional disturbance. Fractures with minimal displacement are usually unaccompanied by great deformity or functional disturbance. On palpation of the area in front of the ear in absence of normal excursion of the condylar head will be found on the side of the fracture. Palpation of this area may reveal crepitus. If there is no associated edema, gross displacement of the condyle head may be disclosed by palpation. Pain may be present in front of the ear with an increase in tenderness during excursion of the mandible.

Disturbance in the occlusal relationship of the teeth is commonly present. Fractures complicated by overriding shorten the distance between the angle and the mandibular fossa. In unilateral fracture the posterior teeth on the affected side are brought into premature contact, thus producing an open bite on the opposite side in the incisor region. Frequently a retro-occlusion of the posterior molar teeth is found on the affected side. When the mouth is open, the distance between the occlusal surfaces is less on the affected side than on the normal side. The chin will also be displaced toward the affected side. Bilateral condylar fractures with upward and posterior displacement of the mandible produce premature contact of the posterior teeth and an open bite anteriorly; in such cases, protrusive excursion of the mandible is impossible. An important method of diagnosing these fractures is to place the index fingers in the auditory canals. Normally, the condyle can be clearly felt here when the mouth is opened and closed. When a fractured condyle is dislodged from the mandibular fossa, these movements are less distinct. When it is dislodged from the capsular ligament, the movement cannot be felt at all. Hemorrhage from the ear may mean that the fractured condylar head may have fractured the tympanic plate. This can be very serious.

#### TREATMENT

The treatment of condylar fractures must be based on diagnostic facts. Accurate roentgenograms showing the fracture line and positions and relations of the fragments are important to the study of the problem. The condition of dentition, disturbance of occlusion, and dysfunction of the mandible during excursion must be considered in planning the treatment. Since condylar fractures are commonly associated with other mandibular fractures, combined evaluation and management are often necessary. The aims of treatment in all mandibular fractures are the restoration of normal function with correct occlusion, or correct interarch relations if the patient is edentulous, and the elimination of the associated deformity. Early reduction and immobilization favor a satisfactory result.

*Closed reduction.*—Closed reduction and immobilization is a form of treatment that has many modifications varying with the specific

problem. If there is little or no displacement and relatively free movement of the mandible, early immobilization by some form of intermaxillary fixation is advocated for 3 to 5 weeks. When displacement or dislocation is evident, an attempt at reducing the condylar fragment is indicated before immobilization. This is particularly important if excursions of the mandible are blocked by the malposed condylar head. Reduction may be attempted by bimanual manipulation extraorally and intraorally. If overriding is present, downward traction on the ascending ramus will permit the return of the condylar fragment to a more normally functioning position. Such manipulative procedures are more efficacious if a general anesthetic is administered to the patient, because displacing forces are released by complete muscular relaxation. When there is overriding of fragments, resulting in an anterior open bite, the muscle spasm may be gradually overcome by anterior intermaxillary elastic traction. With this procedure the posterior opposing teeth act as a fulcrum, while the anterior bite is closed and normal space is restored for the overriding fragments. This principle is employed in the use of posterior bite plates, blocks, and appliances in edentulous posterior areas in order to increase the fulcrumlike action. With the relaxation of the muscles of mastication and restoration of adequate joint space, the condylar fragment may be reduced to a more normal position. The goal of manipulative procedures in such cases is not an accurate anatomic coaptation of fragments but an approximate alignment which does not inhibit mandibular excursions.

The type of immobilization and period of fixation are variable phases of conservative treatment. After manipulative reduction, and assurance that mandibular excursion is not blocked by condylar displacement, some form of fixation may be applied. Among the appliances used for intermaxillary fixation are (a) direct interdental wire ligation; (b) wire lug-forming devices of the Stout or Risdon type; (c) buttons; (d) arch wires, and (e) splints provided with lugs for intermaxillary elastic traction. Each of these appliances is specially designed for a specific type of case. Care must be exercised to minimize irritation to soft tissues and to prevent unbalanced displacing forces on the teeth. The most satisfactory appliance is that which distributes the forces of traction evenly over the supporting dentition with the least damage to periodontal structures. It is generally agreed that fixation should be applied as soon as possible after manipulation of the mandible has restored normal closed occlusion. Closed fixation may be delayed temporarily from 24 to 48 hours while intermaxillary elastic traction produces the desired reduction. Incomplete fixation has been advocated by those who contend that fragment mobility will prevent threatened ankylosis. Early limited excursions are encour-

aged in order to establish a flail joint or pseudarthrosis. According to this concept, an adaptive balance of the muscles of mastication permits adequate functional excursions in such a condition. This principle is preferred by some British authorities for treatment for unilateral condylar fractures. Cap splints which embrace training flanges are frequently cemented to the teeth for guidance of the mobile mandible to proper occlusion.

The management of bilateral fractures of the condyle does not differ significantly. Since typical posterior displacement of the mandible and anterior open bite are often extensive, early and complete reduction and immobilization are advantageous in preventing serious deformity. Sometimes anterior and superior traction may be applied by intermaxillary elastics. When reduction is complete, immobilization is established and maintained for the desired period. The period and degree of fixation will vary with the patient and with the viewpoint of those in charge.

Intracapsular fracture of the condylar head is relatively rare and difficult to demonstrate. Some authorities have designated intracapsular fractures involving articular joint surfaces as those most vulnerable to ankylosis. Treatment by conservative methods is essentially the same as that in other condylar fractures. Since fractures of the condyle are so frequently associated with other mandibular fractures, intermaxillary fixation provides a combined form of treatment. Under these conditions, a compromise must be made between the ideal fixation periods for each fracture. It is considered advisable to continue observation of patients with condylar fracture for 4 to 6 weeks after discontinuing fixation. Minor adjustments in articulation of the teeth may be indicated and are readily made by selective grinding.

*Open reduction.*—In recent years open reduction of fractures of the condyle has been advocated by those who believe that dislocation and appreciable displacement are indications for surgical intervention. The procedure has ranged from reduction through a simple intraoral or extraoral incision to a complex visual reduction with transosseous wire ligation of fragments in exact anatomic relation. The intraoral approach employs a vertical incision 2 cm. long from the tip of the coronoid process inferiorly along the anterior border of the ascending ramus (2). Soft tissues are reflected from the medial surface, and a urethral sound is inserted to engage the medially displaced fragment and reduce it laterally by lever action. The buccal maxillary tuberosity serves as the point of the fulcrum. When the condylar head is reduced, intermaxillary fixation is applied. A similar manipulative procedure may be performed with a small hook through a short horizontal preauricular incision just inferior to the zygomatic arch (3).



Difficulties are encountered in performing a complete open reduction and fixation. Through a vertical preauricular incision, adequate visibility and exposure are difficult; in a small, deep field one must accomplish a difficult technical procedure without damage to such important adjacent structures as the internal maxillary artery, branches of the facial nerve, and the temporomandibular joint capsule; fixation is laboriously complex with this approach. Wire ligation through holes drilled in the approximated fragments is sometimes considered ideal fixation. In selected cases, external pin fixation has been used to supplement internal wiring. *Pins are inserted just below the condylar head and into the temporal zygomatic process.* More radical surgical management employs condylectomy in cases involving wide displacement and dislocations. Several unsuccessful attempts at open reduction have necessitated condylectomy.

All methods of open surgical reduction are combined with some form of intermaxillary fixation. Patients are selected for open reduction when it is considered that they will not respond well to a closed procedure. Advocates of the open procedure emphasize various complications such as ankylosis, traumatic arthritis, limited motion, and malocclusion that may arise when the closed method is used. They suggest that we are not aware of these complications because clinical cases that have been reported were managed by conservative methods and have not been followed closely for years after treatment.

Ivy (4), Berger (5), and many others have stressed the fact that without realignment of fragments, condylar fractures under conservative treatment attain satisfactory functional results. Open operation has not been widely used for many reasons. There are numerous types of condylar fracture in which open reduction and fixation is a technical impossibility. The procedure predisposes to many complications. The fracture is made compound by the procedure, and additional invasion of, and trauma to the joint capsule foster cicatricial processes and ankylosis. Surgical intervention is dangerous because of the proximity of the fracture to several important structures. Direct wiring and pin fixation induce trauma and introduce foreign material, thereby inviting infection and necrosis. Most authors, therefore, prefer the closed reduction technique. Thomas is the greatest advocate of the open reduction method. He has observed satisfactory results in many patients. Other writers, however, cite many more that were treated conservatively with excellent results (3).

In reviewing 155 case histories, I found that about 145 of them were treated conservatively and the remainder by different types of open reduction. I was surprised to find that the patients treated conservatively obtained excellent results, even when displacement was present. The following are some recent case histories of fractures of the man-



relationship of the teeth and jaws. The patient was seen daily for irrigation of the oral cavity and adjustment of the tractor. After 2 weeks there was very little loss of function and no further treatment was deemed necessary, although because of nonunion it was believed that resection might become necessary later. After 23 days all traction was removed. Function was excellent and the patient had no pain or discomfort.

*Case 6*—The patient was sent to the dental clinic because of a fracture of the mandible which had occurred several days previously. Examination disclosed a fracture of the symphysis of the mandible with distal displacement of the right side signifying probable fracture of the condyles. The maxilla was slightly mobile, but was not displaced. Roentgenograms disclosed (a) compound, complete fracture of the symphysis of the mandible, (b) simple, complete fracture of the neck of the condyle of both mandibles, and (c) fracture of the maxilla with cicatricial tissue union and no displacement. Impressions were obtained for the construction of a splint. Penicillin in doses of 300,000 units daily was given for 5 days. On the third hospital day the fractures were reduced and the splint applied. Intramaxillary wiring was applied to the maxillary teeth and occlusion was established with elastic traction. One week later the occlusion was normal. Thirty-three days after traction was applied it was removed. Roentgenograms taken at that time showed good alignment of the fractures and some callus formation. Seventeen days later the splint was removed. The occlusion was adjusted to provide a better cuspal relationship. There was no deformity or loss of function.

*Case 7*—The patient reported to the dental clinic with injuries received 2 days previously. Examination and roentgenograms disclosed (a) compound comminuted fracture of the maxillary alveoli from L-3 to R-5, (b) fracture of the teeth L-1, R-1, R-2, R-3 and R-4, (c) compound fracture of the anterior one-third of the palatine bones with posterior displacement, (d) complete, compound fracture of the left mandible in the region of the mental foramen, and (e) fracture of the neck of the condyle of the left mandible displacing the condyle medially out of the glenoid fossa. The mandible was manipulated under local anesthesia in an attempt to replace the condyle without success. The fractured teeth were extracted and the loose pieces of alveolar bone were removed up to and including the anterior concave portion of the vomer. Hemorrhage precluded the removal of two root tips of R-4 at this time. The palatine bones attached to the mucoperiosteum of the palate were placed in position and the soft tissues were sutured. Impressions were obtained for a maxillary splint. A gauze pack was then placed against the palate and held under pressure by wires from the bicuspid teeth. Continuous loop wiring was applied to the mandibular teeth. A head bandage was then applied to stabilize the jaws and the patient was returned to the ward. After 3 days the upper splint was applied. Traction was placed so as to create space for the condyle to be returned to the glenoid fossa. Two days later it was apparent that the condyle was not being reduced, so normal occlusion was established and elastic traction was applied to maintain this position. The patient was seen daily for irrigations of the oral cavity and adjustment of the tractor. Two weeks after traction was applied it was removed and 2 days later the splint was removed. The vertical opening was excellent as were the left lateral and protrusive excursions. There was limitation of the right lateral excursion. There was apparently no impingement on any nerves by the misplaced condyle. On the next day the residual roots were located and removed, and 3 days later all wiring was removed. It was estimated that 6 more weeks would be required before an upper partial denture could be made. The left

## SUMMARY

Fractures of the condyle have been classified according to the displacement or dislocation of the condylar fragment. The prime objective of treatment is the restoration of normal function and the elimination of any associated deformity. Conservative methods of reduction and intermaxillary fixation are simple and effective.

## REFERENCES

1. THOMA, K. H : Oral Surgery Vol I The C. V. Mosby Co., St. Louis, Mo., 1948. pp. 611-617.
2. SILVERMAN, S. L.: A new operation for displaced fractures at neck of mandibular condyle. Dental Cosmos 67: 876-877, Sept. 1925
3. THOMA, K. H.; HOWE, H. D., and WENZIG, M.: Fractures of condyle of jaw. Am. J. Orthodontics (Oral Surg. Sect.) 31: 220-226, Apr. 1945
4. IVY, R. H., and CURTIS, L.: Further observations on fractures of mandible. Dental Cosmos 71: 341-352, Apr. 1929
5. BERGFR, A.: Fracture of mandibular condyle. J. Am. Dent. A. 30: 819-823, June 1, 1943



patients he had seen in the current epidemic in Japan. He recommended discontinuing the sulfadiazine because of the danger of renal damage and that the patient be removed to a general hospital for observation for a brain abscess. It was believed that the intensive intrathecal therapy with penicillin contributed to her fever, increased her spinal fluid cell count, and produced signs of meningeal and central nervous system irritation.

#### DISCUSSION

*Absorption rates of penicillin given intramuscularly.*—Early clinical investigation has revealed that parenteral administration of penicillin does not result in its excretion into the subarachnoid space of normal persons in bacteriostatic concentrations (1) (10). Some penicillin was found in the cerebrospinal fluid 31 hours after parenteral injection but not in effective concentration (11). It was absorbed more readily and produced higher concentrations when given parenterally in patients with meningitis if the infection was acute (12). In patients with chronic low-grade meningitis, parenteral injections did not result in effective concentrations of the drug in the cerebrospinal fluid (11). In those with acute meningitis, a bacteriostatic level of penicillin in the cerebrospinal fluid could not be attained for more than 1½ hours by parenteral administration. To attain such levels, large amounts (500 to 5,000 units per kg. of body weight) were required and even then the levels obtained were quite variable (13). There was no assurance that the patient would attain a beneficial titer of the bacteriostatic agent in the cerebrospinal fluid, since the absorption of the same amount was unpredictable after repeated administrations. Thus, direct instillation of penicillin into the subarachnoid space was necessary if high levels were desired in treating infections of the meninges caused by susceptible organisms.

*Dosage schedules recommended*—It was noted early in the literature that administration by such a route would result in harmful reactions. In 1944 a report appeared suggesting that penicillin had detrimental effects on the central nervous system after intrathecal instillation (3). Prior to this, Rammelkamp and Keefer (1) advocated that penicillin be given intrathecally, but in dosages not exceeding 3,000 to 5,000 units daily because of the possible occurrence of pleocytosis in the cerebrospinal fluid after large doses.

Other writers recommended intrathecal doses of never more than 10,000 units daily, but reports again began to appear showing that penicillin was being used in larger amounts (3) (14). Each report illustrated that penicillin acted on the meninges as an irritating foreign body and produced many undesirable effects. The lowest reported intrathecal amount to cause signs of meningeal reaction was

18,000 units (3) (15). The largest amount recorded as having been used in a single intrathecal injection was 300,000 units (16). This was followed by symptoms compatible with severe adhesive arachnoiditis, which was later proved at craniotomy.

*Specific toxic reactions in man.*—Although the previously mentioned cases and an increasing number of others have appeared in the literature in the past 5 years, it appears to be necessary to call attention to the reactions that occur when the drug is used intrathecally. These reactions have included: (a) damage to the cauda equina and spinal cord (17); (b) flaccid and spastic paralysis of the extremities (15); (c) status epilepticus (18); (d) adhesive arachnoiditis (16); (e) transverse myelopathy (6); (f) sacral radiculitis (8); (g) convulsive seizures (18) (19) (20); (h) optic atrophy (3); (i) general signs of meningeal irritation (2) (4) (7) (9) (21); and (j) pleocytosis of the cells in the spinal fluid (5) (22). The symptoms and signs that may be produced are shown in table 1. Most of the experimental work has been done on the convulsive effects of penicillin given intrathecally (19) (23) (24). The effective bacteriostatic agent in penicillin is itself responsible for the convulsions produced. Certain impurities that cause pyrogenic reactions do not appear to cause the convulsions.

Whether the convulsions that occurred in our case could be attributed directly to the use of the drug or whether they resulted from the febrile reaction cannot be definitely stated, but it would appear that the penicillin was a contributing factor.

TABLE 1.—Symptoms and signs following intrathecal administration of penicillin<sup>1</sup>

General:	Neurologic:
Fever.	Convulsions.
Headache.	Paresthesia.
Irritability.	Facial nerve palsy.
Listlessness.	Loss of speech.
Cardio-respiratory:	Nuchal rigidity.
Vascular collapse.	Paralysis of extremities.
Irregular respiration.	Muscular fibrillation.
Gastrointestinal:	Muscular spasm.
Nausea.	Signs of pyramidal tract irritation.
Vomiting.	Incontinence of urine.
	Abnormal electro-encephalogram.
	Pleocytosis and increased globulin in the spinal fluid.

<sup>1</sup> Adopted from Morganson (21).

## CONCLUSIONS

1. The safest dosage of penicillin given intrathecally appears to be not over 10,000 units daily.

2. Toxic reactions are to be expected if dosages above this level are used

3. Penicillin should not be used intrathecally unless specifically indicated

4. It is apparent that the stormy clinical course in the case reported was caused by the repeated intrathecal administration of penicillin. There was no sound indication for the intrathecal administration of penicillin in what was presumably preparalytic poliomyelitis.

## REFERENCES

1. RAMMELKAMP, C. H., and KLEFER, C. S.: Absorption, excretion, and distribution of penicillin. *J Clin Investigation* 22: 425-437, May 1943.
2. ROSENBERG, D. H., and ARLING, P. A.: Penicillin in treatment of meningitis. *J A M A*, 125: 1011-1017, Aug 12, 1944. preliminary report. Treatment of cerebrospinal fever with penicillin. *U. S. Nav. M. Bull.* 43: 251-257, Aug. 1944.
3. WARING, A. J., JR., and SMITH, M. D. H.: Combined penicillin and sulfonamide therapy in treatment of pneumococcal meningitis. *J A. M. A.* 126: 418-424 Oct 14 1944.
4. NEYMANN, C. A.; HEILBRUNN, G.; and YOUNG, G. P.: Experiments in treatment of dementia paralytica with penicillin. *J. A. M. A.* 128: 437-434, June 9, 1945.
5. RAMMELKAMP, C. H., and KLEFER, C. S.: Absorption, excretion and toxicity of penicillin administered by intrathecal injection. *Am. J. M. Sc.* 205: 342-350, Mar 1943.
6. SIGAL, S.: Transverse myelopathy following recovery from pneumococcal meningitis treated with penicillin intrathecally; report of case with note on current methods of therapy. *J A M A* 129: 547-550, Oct 20, 1945.
7. SIMONS, S.: Untoward effects of penicillin prophylactic use in spinal block operations. *Clin Med* 52: 87-89, Mar 1944.
8. SWEET, L. K., DI MORTA-STANLEY, E., DOWLING, H. F.; and LEPPER, M. H.: Treatment of pneumococcal meningitis with penicillin. *J. A. M. A.* 127: 263-267 Feb 3, 1945.
9. VAN WIEMOKLT, S. S., and BROWN, P. W.: Pneumococcal meningitis with severe therapeutic complications; report of case. *Proc Staff Meet, Mayo Clin* 20: 157-160 May 16, 1945.
10. HEBBELL, W. E.: Clinical use of penicillin; antibacterial agent of biologic origin. *J A M A* 124: 622-627, Mar. 4, 1944.
11. KAPLAN, L. I.; READ, H. S.; BECKER, P. T.; and DEMORE, C. F.: Concentration of penicillin in spinal fluid following intramuscular administration in meningitis, negative report. *J Lab & Clin Med* 31: 317-322, Mar 1944.
12. ROSENBERG, D. H., and SYLVESTER, J. C.: Excretion of penicillin in spinal fluid in meningitis. *Science* 100: 132-133, Aug 11, 1944.
13. ... .. various body  
1945  
Jr. Treatment of staphylococcal, pneumococcal, gonococcal and other infections with penicillin. *J A M A* 127: 253, Feb 3, 1945; 327, Feb 10, 1945.
15. FORREST, A. R.: Neurological complications in cerebrospinal meningitis treated with penicillin. *Brit M J* 2: 805-806, Dec 8, 1945.

16. MILLIKAN, C. H., and SAHS, A. L.: Adhesive arachnoiditis following intrathecal administration of penicillin. *J. Iowa M. Soc.* 37: 198-201, May 1947.
17. BRADFORD, F. K.: Treatment of pyogenic infections of central nervous system with intraspinal penicillin; apparent damage to cauda equina and spinal cord. *M. Rec. & Ann.* 40: 1514-1516, Aug. 1946.
18. JOHNSON, H. C., and WALKER, A. E.: Intraventricular penicillin, note of warning. *J. A. M. A.* 127: 217-219, Jan. 27, 1945.
19. WALKER, A. E., and JOHNSON, H. C.: Convulsive factor in commercial penicillin. *Arch. Surg.* 50: 69-73, Feb. 1945.
20. WALKER, A. E.; JOHNSON, H. C.; and KOLLROS, J. J.: Penicillin convulsions; convulsive effects of penicillin applied to cerebral cortex of monkey and man. *Surg. Gynec. & Obst.* 81: 692-701, Dec. 1945.
21. MORGINSON, W. J.: Toxic reactions accompanying penicillin therapy. *J. A. M. A.* 132: 915-919, Dec. 14, 1946.
22. PILCHER, C., and MEACHAM, W. F.: Chemotherapy of intracranial infections; treatment of experimental staphylococcal meningitis with intrathecal administration of penicillin. *J. A. M. A.* 123: 330-332, Oct. 9, 1943.
23. BORKOWSKI, W. J., and FORSTER, F. M.: Convulsant effects of penicillin on cerebral cortex. *J. Neuropath. & Exper. Neurol.* 6: 201-205, Apr. 1947.
24. PILCHER, C.; MEACHAM, W. F.; and SMITH, E. R.: Epileptogenic effects of penicillin; experimental study. *Arch. Int. Med.* 79: 465-472, Apr. 1947.





# Mosquito Control Problems in Japan

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MALARIA, filariasis, dengue, and Japanese encephalitis are the mosquito-borne diseases of man known to occur in Japan. Malaria was not a reportable disease in Japan prior to Allied occupation and the information available on its incidence and distribution does not permit accurate evaluation of the problem over a period of years. The statistics compiled by the Public Health and Welfare Section, Supreme Commander for the Allied Powers, show about 11,000 cases of malaria among the Japanese in 1947, and 4,752 cases in the first 11 months of 1948. Cases were reported from all Prefectures of the country in both years for which complete records are available. About one-half of the cases reported in 1948 occurred in Shiga Prefecture in south central Honshu and the remaining cases reported showed a rather even distribution throughout the four principal islands. This distribution strongly suggests that, except for Shiga Prefecture, a large number of cases of malaria are occurring among repatriates and returned Japanese soldiers who contracted the disease elsewhere. This conclusion is further supported by the fact that the total number of cases reported in 1947, when repatriation was continuing at a high level, was more than double the number reported in 1948. All information at hand supports the contention that malaria does not constitute a significant public health problem in Japan.

No significant filariasis surveys have been conducted among the Japanese to date by Allied Medical Department personnel. In three separate areas on south central Honshu, malaria survey detachments made about 1,000 thick smears on adults and in this series only 1, that of a Chinese who had resided most of his life in southern Malaya, was positive for filariae. The latest extensive surveys performed by

<sup>1</sup> 207th Malaria Survey Detachment.

Japanese workers were made in 1926 among soldiers of the Japanese Army. Endemicity for filariasis in the latter studies varied from 0 to 2 percent in Prefectures in the southern half of Honshu while on the southernmost island of Kyushu, infection rates varied from 0.5 to 12 percent in the Prefectures in which surveys were made. The highest rates recorded were along the western and southern coasts of Kyushu. More up-to-date surveys, accomplished under carefully controlled conditions are in order at present and a new appraisal of the problem would be the only basis on which to evaluate the relative importance of this disease from a public health point of view.

According to Japanese informants, dengue was unknown in Japan prior to 1942. There is no evidence to back this claim other than a record to this effect contained in an unpublished paper made available by a member of the teaching staff at Kyoto University. Data enumerated here were obtained from the latter source. In 1942 an epidemic of about 13,000 cases of dengue occurred in Nagasaki, Kyushu, and in 1943 over 10,000 cases were recorded in the Kobe-Osaka-Kyoto area in south central Honshu. In 1944 and 1945 fewer cases were seen and these were also limited largely to the epidemic area of 1943. No cases have been recorded in Japan since 1945. Dengue outbreaks from 1942 through 1945 were of about 7 weeks' duration beginning in late July and terminating shortly after mid-September. The benign nature of this disease and the present lack of evidence of its actual establishment on these islands serve to relegate it to a secondary position in the mosquito-borne disease problem.

From the standpoint of case incidence, severity, and geographic distribution, Japanese encephalitis is the most important mosquito-borne disease in Japan. Outbreaks that were probably Japanese encephalitis date back to 1871, but the first large epidemic on record occurred in 1924. Over 6,000 cases were recorded in that year. Another epidemic involving over 5,000 cases occurred in 1935, followed by the largest outbreak on record in 1948 with 8,023 cases and 2,455 deaths, giving a case fatality rate of about 30 percent while the case fatality rates in previous epidemics ranged as high as 60 percent. In the years between 1935 and 1948 the incidence varied from a few cases to 2,800 with some cases occurring almost every year. About 33,000 cases are on record from 1924 through 1948. The figures quoted make no allowances for patients who may have been misdiagnosed.

In the 1948 outbreak there were 30 cases of the disease with 5 deaths among occupation personnel. No figures showing the occurrence of the disease in immunized persons were available. This disease appears regularly from year to year in the south central portion of Honshu in the inland-sea area, and while it occurs particularly in epidemic

years in all islands of the archipelago it is rarely seen in the northernmost island of Hokkaido. Serologically it can be shown that a large proportion of the indigenous population has had experience with the virus. It is estimated that the ratio of clinically recognizable cases to inapparent infections is between 1:300 and 1:1000. Thus, we have a disease that is practically nation-wide in distribution, a fact which is important in considering mosquito control as a means of protecting the population.

#### IMPORTANT VECTORS

There are about 50 species of mosquito in Japan but of this number not more than 8 are important from the standpoint of their feeding habits. Among those which feed on man readily are *Culex pipiens pallens*, *C. tritaeniorhynchus*, *C. bitaeniorhynchus*; *Aedes albopictus*, *A. flavopictus*, and *A. vexans nipponii*, all of the latter being important day-biting mosquitoes. *Anopheles hyrcanus sinensis* is the only important anopheline and is the vector of malaria in Japan. In certain sections of the country a representative of the genus *Mansonia* occurs and it is a severe pest in the localities where it is established.

Japanese workers claim to have isolated the virus of Japanese encephalitis from *C. tritaeniorhynchus* in nature and the evidence at hand points to this species as the principal vector of the disease. *C. pipiens pallens*, a closely related species, is claimed, on the basis of studies carried out by Japanese, to carry the virus in nature and its habits and seasonal incidence strongly incriminate it as a possible vector. *A. albopictus* is the most likely vector of dengue. Filariasis may be transmitted by any of the mosquitoes which feed on human beings since the entire group has been proved experimentally to be capable of transmitting this disease.

The composite list of breeding sources of mosquitoes that readily feed on man in Japan is most impressive and emphasizes the difficulty of control. Most important species live in close proximity to human habitation and practices associated with agricultural pursuits create a large proportion of mosquito-breeding habitats. An understanding of the basic problem entails a knowledge of local agricultural practices. Rice constitutes the principal agricultural crop of the country. The rice paddies are flooded in June and remain under water throughout the breeding season of the important species of mosquito. In addition to the paddies, rice-growing districts are heavily interlaced with a system of drainage and irrigation ditches containing stagnant or slowly moving water. Night soil constitutes a large part of the fertilizer employed in growing crops and the tanks used for storing it dot the landscape wherever crops are grown. In the application of night soil as fertilizer large quantities of water are used. Thus

we have a large portion of the land under water and productive of some mosquitoes through the summer months, mosquito-producing rice paddies in abundance, and night-soil storage and garden-irrigation tanks scattered throughout the rural areas serve to further augment the mosquito population. To these can be added poorly constructed roadside ditches, gutters, and, occasionally, extensive unreclaimed marshy areas. A few of the smaller breeding sources include innumerable artificial containers such as drums, bowls, buckets, cans, urinal crocks, flower pots, decorative stone vases, native latrines, cisterns, water-holding rubble in bombed areas, and the stumps and posts of cut bamboo. Thus we have a diverse and extensive breeding problem presenting a difficult approach from a control standpoint.

Temperature and rainfall have a determining influence on mosquito propagation. The daily high temperature normally reaches 70° F. about the beginning of May in all areas of Japan south of Tokyo, at or near sea level. There is a gradual increase in daily mean temperatures from May to late June at which time daily high readings are between 80° and 85° F. In early July daily temperatures reach 90° to 95° F. and this level is maintained to the end of August. June and September are usually the wettest months but there is no true wet or dry season in Japan. Seasonally the first heavy impetus to propagation of mosquitoes is given by the higher temperatures attained in the latter part of June coupled with heavy precipitation occurring in that month. There is a steady upward climb of the density curve of biting species through July with a peak usually attained by mid-August. A great decrease in mosquito density occurs in the latter part of August and with the onset of cooler weather in September the density quickly approaches zero. The mosquito-control program requires close attention in the field from about mid-May through mid-September in the area extending south from Tokyo. A mosquito-control program must be based on a knowledge of the mosquito-borne diseases present in a given area, their relative endemicity or epidemicity largely determining the amount of time and money to be expended. In some parts of the world the degree of discomfort occasioned by pest mosquitoes or economic considerations determine the appropriation of funds for abatement projects. In Japan, any or all of these factors may be considered, depending on the time of the year, seasonal variations in the intensity of mosquito activity, geographic location, and the presence in some seasons of mosquito-borne epidemics.

About 30 percent of the land in Japan is arable and the populated areas coincide closely with areas potentially productive agriculturally. Similarly the mosquito-control areas coincide closely with the arable land since the remainder of the country is mountainous and sparsely

populated. The total land area of Japan exclusive of Hokkaido is 113,000 square miles. The 30 percent which is populated represents an area of about 34,000 square miles that would require coverage at 10-day intervals over a period of at least 4 months each year, if abatement were to be successful. It is, therefore, doubtful whether abatement on a nation-wide basis, exclusive of the northernmost island of Hokkaido, is feasible. Public health is purchasable, for a price, but the cost of this phase would probably be too great to be justified by the resulting improvement in health. The long-term plans for expenditures of public funds for mosquito-abatement programs in Japan must be economically sound, and must be capable of successful accomplishment.

Some indication of the relative success we have met this far in control operations may be deduced from field survey data obtained over several years. Human beings were used as bait and capture of adult mosquitoes were made as they settled on their victims. Biting intensity records were made at 3- to 4-day intervals between 1900 and 2300 hours from late July to the end of the first week in September in 1946 and 1947. A large city of over a million inhabitants and a typical rice-growing district were selected for study since these areas afforded an opportunity for comparison of population densities in typical urban and rural localities. During 1946, in the urban area, biting intensities varied from an average hourly low of 6 to a high of 35 per hour and throughout August the average biting rate never fell below 20 in all hourly periods recorded. During the same year in the rural area biting rates varied from an average low of 20 to a high of over 100 per hour. Similar observations at the same collection points were made in the summer of 1947. While the biting rates were slightly lower in 1947, the extent of reduction was not significant.

During July and August 1948 large numbers of resting adult females were collected in the vicinity of Okayama in southern Honshu and frequently a single stable yielded several thousand mosquitoes. Stables were usually small and seldom sheltered more than a few domestic animals. Similarly, light trap collections made in the same area yielded from 500 to over 1,000 mosquitoes in a single night's catch. These figures indicate that despite the control program, a sufficient mosquito population was maintained to present a serious pest or disease vector problem if mosquito-borne diseases had made their appearance.

All of the factors underlying the 1948 outbreak of Japanese encephalitis, the largest in the history of Japan, are not known. While it is possible that the magnitude of the outbreak could reflect a breakdown in efficiency of mosquito-control operations as compared with the 2 previous years, it is doubtful on the basis of previously cited data

that an outbreak of the same magnitude might not have occurred sooner had other requisite factors occurred. We must recognize the fact that in the third year of the mosquito-control program in Japan its inadequacy in controlling Japanese encephalitis was evident. So far only the surface in effective mosquito eradication has been touched even in the large urban centers of population. In smaller communities and rural areas the situation is probably much the same as it was prior to the war. The progress made represents a beginning but the task ahead is tremendous if the ultimate goal is mosquito control, limited even to the larger population centers.



# A Method for Testing Sensitivity of Organisms to Antibiotics

JOHN P. RANSOM, Major, MSc, U. S. A.<sup>1</sup>

THE clinical effectiveness of penicillin is paralleled by the sensitivity of the invading organisms in vitro (1) (2). The efficacy of penicillin in the treatment of infection may be accurately determined by testing the sensitivity of the organism in vitro (3). Penicillin K is more active in vitro than in vivo (4). This fraction has now been largely eliminated from commercial preparations. A similar parallelism between in vitro and in vivo activity has been shown for streptomycin. These facts have been reviewed and summarized recently by Keefer (5) and Goldstein (6). Sensitivity tests on organisms are desirable if the proper antibiotic is to be prescribed in the optimal dosage. Frequently, an organism that shows a high degree of resistance to penicillin will be found to be sensitive to streptomycin. The sensitivity spectra of organisms isolated from human infections have thus become as important as their isolation and identification. Goldstein emphasizes the importance of frequently determining organism sensitivity and, as far as possible, increasing the dosage of the antibiotic to meet new thresholds.

*Penicillin sensitivity test.*—A stock dilution of penicillin potassium containing 20 units per ml. is prepared in sterile physiologic saline solution. The following dilutions are then prepared 10, 5, 2.5, 1.25, 0.62, 0.31, and 0.15 units per ml. One milliliter of each dilution is added to a sterile labeled Petri dish to which is then added 9 ml. of melted and cooled tryptose blood agar with a pH of 6.8. The contents of each Petri dish is mixed before solidification by gentle clockwise and counterclockwise rotation. Plates may be stored in the refrigerator for not more than 24 hours before use. The final concentrations represented by these plates are .1, 0.5, 0.25, 0.125, 0.06, 0.03, and 0.015 units per ml.

<sup>1</sup> Oliver General Hospital, Augusta, Ga.

Well-isolated colonies of organisms to be tested are transferred from diagnostic plates to small test tubes containing about 1 ml. of tryptose phosphate broth to which has been added a loopful of sterile, Seitz-filtered, human serum. These booster broth tubes are incubated at 37° C. Control cultures of *Staphylococcus aureus* (Heatley, Eden, or F. D. A. 209P) are set up at the same time. In this laboratory, a culture of a penicillin-resistant staphylococcus is also prepared.

A sterile cotton swab is saturated with the booster broth culture after incubation for 4 to 6 hours. Excess medium is squeezed from the cotton tip against the side of the tube. A sector of each penicillin plate and of a control plate without penicillin is inoculated with the swab, making a single line streak on each plate, working from the plate containing the lowest to the one containing the highest concentration, inoculating the control plate first. Separate sectors are thus inoculated with various organisms to be tested. Six organisms can be conveniently tested on a single set of plates. Each set should also be inoculated in sectors reserved for the control organism. The results are read after overnight incubation. Growth or lack of growth is recorded for each organism on each plate. The sensitivity is then reported as the lowest concentration at which growth is completely inhibited.

*Streptomycin sensitivity test.*—The stock solution for the streptomycin sensitivity test contains 640 micrograms per ml. The following dilutions are then prepared in physiologic saline solution: 640, 320, 160, and 80 micrograms per ml. Plates prepared in the manner previously described are used, except that the agar base is adjusted to a pH of 8. The final dilutions represented by four plates are 64, 32, 16, and 8 micrograms per ml. Preparation of the organisms to be tested, inoculation of the media, and reading of the results are similar to that described for the penicillin sensitivity test. *Proteus OX19* may be used as a control organism. The cultures of this organism employed here do not grow on the lowest concentration of streptomycin used.

#### DISCUSSION

Routine sensitivity testing of isolated organisms may be adjusted to meet local needs. Beta-hemolytic streptococci from sputa, wounds, abscesses, pleural fluids, urine, blood, and aural discharges are tested for sensitivity to penicillin, and if found to be resistant, are tested for sensitivity to streptomycin. Staphylococci are treated similarly. Gram-negative rods are tested for sensitivity to streptomycin only. Such organisms as *Neisseria gonorrhoeae* and *Diplococcus pneumoniae* are not routinely tested because they are regularly sensitive. Organisms that require special growth factors or atmospheric conditions,



such as *Hemophilus influenzae* and *Clostridium welchii*, are not routinely tested because special attention to the details of technique is necessary with such organisms. The sensitivity tests described have advantages in that (a) they are sufficiently accurate to be clinically useful, (b) they can be applied readily to most of the pathogenic bacteria isolated, and (c) the results can be read within 48 hours after the initial isolation.

#### REFERENCES

1. RAMMELKAMP, C. H., and MAXON, T. Resistance of *Staphylococcus aureus* to action of penicillin. *Proc Soc Exper Biol & Med* 51: 356-359, Dec 1942
2. SCHMIDT, L. H., and SFSLER, C. L.: Development of resistance to penicillin by pneumococci. *Proc Soc Exper Biol & Med* 52: 353-357, Apr 1943
3. RAKE, G., MCKEE, C. M., HAMRF, D. M.; and HOUCK, C. L.: Studies on penicillin; observations on therapeutic activity and toxicity. *J. Immunol* 48: 271-289, May 1944.
4. FAGIN, H. and MUSSELMAN, A. Low therapeutic activity of penicillin K relative to that of penicillins F, G, and X, and its pharmacological basis. *Science* 103: 618-620, May 17, 1946
5. KEEFER, C. S. The uses of penicillin and streptomycin. Porter Lectures, Series 15. University of Kansas Press, 1949
6. GOLDSTEIN, A. Antibacterial chemotherapy. *New England J Med* 240: 98-107, Jan 20, 1949; 137-147, Jan 27, 1949; 180-188, Feb. 3, 1949.



# About the Army Medical Department

## The New Army and Air Force Interns

PAUL I. ROBINSON, *Colonel, MC, U S A*<sup>1</sup>

FROM 1,014 applications, 199 interns were selected for Army internships and 53 for Air Force internships. Both Army and Air Force interns receive their training in Army general hospitals. Of the 252 selectees, 236 have had previous service in the Armed Forces; 44 of the 53 selected by the Air Force had prior service with the Army Air Force; and 28 of the 252 had wartime service in the Medical Service Corps. The General Staff Corps, Infantry, Field Artillery, Coast Artillery Corps, Corps of Engineers, Armored Cavalry, Quartermaster Corps, Military Intelligence Service, Adjutant General's Department, and Ordnance Department are all represented in the former service of our interns. The composite nature of the group is further indicated by the fact that 5 were Marines and 18 were in the Navy during the war.

Five of our interns had advanced to the grade of lieutenant colonel during their former service, 25 to major, and 51 to captain. They all now come in as first lieutenants in the Medical Corps and will not be eligible for promotion until they have finished their internships. While promotions after an internship depend to a large extent on the vacancies which will exist at that time, it is expected that it will be possible to promote Medical Corps officers to the grade of captain sometime during the year following the completion of their internships.

Fifty-four of our interns this year will be assigned to Walter Reed General Hospital, Washington, D. C.; 35 to Letterman General Hospital, San Francisco, Calif.; 34 to Fitzsimons General Hospital, Denver, Colo.; 30 to Madigan General Hospital, Tacoma, Wash.; 14 to William Beaumont General Hospital, El Paso, Tex.; 24 to Tripler General Hospital, Honolulu, T. H.; 11 to Gorgas Hospital, Ancon, C. Z.; and 50 to Brooke General Hospital, San Antonio, Tex. Many of the selectees had appointments in other Army hospitals that have since been closed and have had changes in their assignments. These reassignments were accomplished without difficulty and without detri-

<sup>1</sup> Personnel Division, Office of the Surgeon General, Department of the Army.

ment to the internship programs in any of the remaining hospitals. All training spaces are fully authenticated by the Council on Education and Hospitals of the American Medical Association.

In order that interns will get even broader experience, a system of rotation through suitable local Army or Air Force medical installations has been instituted at two of our hospitals. Under this system, many of this year's interns will have an opportunity to serve a few months in station hospitals as well as general hospitals. For example, interns at Walter Reed General Hospital will rotate through a total of 11 services: 4 in obstetrics and gynecology, 2 each at Fort Belvoir Station Hospital and Bolling Field Station Hospital; 3 in general surgery, 1 at Fort Belvoir Station Hospital and 2 at Bolling Field Station Hospital; and 4 in internal medicine in the hospital at the Old Soldiers' Home, Washington, D. C. Interns assigned to Letterman General Hospital may rotate through 11 services in medicine, surgery, obstetrics, and electives at Fort Ord Station Hospital and Camp Stoneman Station Hospital. Other hospitals may work out similar plans with nearby installations that have adequate staffs in the specialty in which the intern is rotated. In every case, the training will remain under the supervision of the appropriate professional service of the parent hospital and not more than 25 percent of the interns assigned will be absent from the parent hospital at any one time under the rotating plan. An intern will be rotated but once and at only one of the satellite installations. It is expected that this plan will acquaint the participating intern with an attractive phase of military life and at the same time afford him the opportunity to render medical care of a limited nature more on his own responsibility than might have been possible in a larger hospital.

Interns were appointed under the cooperative plan agreed on by the Association of American Medical Colleges, the American Medical Association, the American Hospital Association, the American Protestant Hospital Association, and the American Catholic Hospital Association. In selecting interns, special consideration was given this year to participants in the Medical Reserve Officers Training Corps Program and to those who indicated that they were definitely interested in a military career.

Within the past few months the Army, Navy, and Air Force Medical Departments have all agreed in the publication by the Secretary of Defense of standard policies applying to interns and residents. One of the policies requires that interns entering the program after 31 December 1950 will do so with the understanding that they will be required to serve 1 year of active duty for each year of formal internship in a military hospital. This does not apply to the group of interns coming on duty between 1 July 1950 and 31 December 1950

As in previous years, internships in Army hospitals are rotating in character and are of 12 months' duration. In general, duties of interns correspond to those in civilian hospitals and there is ample opportunity for discussions of problems with both military and civilian teachers in the fields of clinical medicine. On satisfactory completion of 8 months of internship, interns become eligible to apply for appointment in the Regular Army. They will not be commissioned until after the internship has been completed. Interns may also extend their Reserve categories for 1, 2, or 3 years—an opportunity embraced by many of last year's interns in order to further their knowledge of military medicine before definitely electing it as a career.

As the year of internship progresses, many will be interested in what the future holds. Some of this group will want information regarding the basic medical course at the Army Medical Department Research and Graduate School and the Medical Field Service School. Others will be interested in residencies in one specialty or another. Information on all these subjects will be made available from time to time and representatives of the Surgeon General's Office will be available to discuss the various problems now and then during the internship year. All of the assignments to schools and residencies, in which interns are interested will be awarded by means of definite policies that will be made known to everyone. The standing the officer achieves in his internship will have no little weight in the final selection because effort is made to keep everything on a fair and just competitive basis.

Those of us who interned in the Army many years ago look back at this period with nostalgia. It is with all sincerity, therefore, that we welcome this group of interns to our military hospitals. We are sure that many of them will also, as years go by, have the same feeling of pride that we have when we mention our internship classes at Walter Reed, Fitzsimons, or any of the other hospitals that have grown to mean so much in the military establishment.

Meet the 1950 interns:

*Army interns*

Name	Medical school	Hospital of internship
Anlage, Henry J	St. Louis University	Fitzsimons
Arnold, Asdrubal	Temple University	Walter Reed
Asay, Loyal D	Yale University	Brooke
Askins, John R., Jr	University of Oklahoma	Fitzsimons
Babb, John L	Ohio State University	Brooke
Barilla, Timothy G	George Washington University	Walter Reed
Barnett, Arthur J	Georgetown University	Brooke
Baurh, James F	University of Georgia	Madigan
Beckner, William W., Jr	Medical College of Virginia	Goreaux
Beddow, Ralph M	University of Oregon	Walter Reed
Bennett, Reginald A., Jr	Duke University	William Beaumont
Billings, Harry H	University of Minnesota	Tripler
Blair, Robert T	University of Cincinnati	Walter Reed
Blaschke, John A	University of Oklahoma	Letterman

## Army interns—Continued

Name	Medical school	Hospital of internship
Bolton, Rolt F		William Beaumont
Borsky, Anthony A		Fitzsimons
Bosman, Robert I		Walter Reed
Bovson, William A		Do
Brand, Roscoe C, Jr		Brooke
Breakstone, Gerald J		Lettsman
Brickel, Ottis B		Fitzsimons
Brock, Mason F		Tripler
Brooks, Donald A		Madigan
Brown, Paul W		Letterman
Brown, William F		Madigan
Brynes, Stephen M		Do
Buchele, Matthew I		Brooke
Buckmaster, George A		Madigan
Buesch, John F		Do
Byrne, Haynes C		Tripler
Callista, Richard I		Madigan
Casey, John J		Gorgas
Casper, Robert B		Fitzsimons
Chadwick, John B		Gorgas
Chaves, Roswell S		Walter Reed
Clock, Thornton I		Brooke
Coats, Daniel T		Letterman
Coller, Richard L		Brooke
Cornely, John F		Fitzsimons
Craig, Gus A		Madigan
Cutshall, Vernon		Fitzsimons
Danals, John K		William Beaumont
DeL, John D		Brooke
Deha, Claude W		Do
DeSimone, John C	Alabama Medical College	William Beaumont
Donstello, Edward P	University of Minnesota	Tripler
Dorle, Patrick J	Tufts College	Brooke
Earle, Leon H, Jr	do	Walter Reed
Faves, Charles C	Baylor University	William Beaumont
Eckstein, John W, Jr	State University of Iowa	Letterman
Edwards, Thomas S	Tulane University	Brooke
Elder, Lindsey T, Jr	Harvard University	William Beaumont
Fells, Kent	Yale University	Walter Reed
Engel, Harold L	University of Southern California	Letterman
Essa, John	University of Pittsburgh	Walter Reed
Fittmeier, Charles	New York University	Do
Fwart, James A	University of Pennsylvania	Brooke
Feldmann, Robert J	Harvard University	Tripler
Ferguson, Robert P	State University of Iowa	Fitzsimons
Fenneman, Milton	University of Pennsylvania	Gorgas
Finn, Murray F	St. Louis University	Brooke
Flaxer, Carl	University of Colorado	Fitzsimons
Fortson, Luther G, Jr	Emory University	Brooke
Frankbouser, C. M., Jr	Long Island College	Do
Fredrickson, Evan L	University of Wisconsin	Walter Reed
Freeman, Rex W	Southwestern University	Brooke
Fromme, Vernon L	Emory University	Walter Reed
Geizer, Hugh S, Jr	do	Fitzsimons
Glenn, James C	University of Oklahoma	Lettsman
Goules, Ralph G	University of Utah	Walter Reed
Grad, John F	University of Buffalo	Do
Grant, Arthur F	Western Reserve University	Fitzsimons
Grant, Norman L	Columbia University	Madigan
Green, Robert W	University of Pittsburgh	Walter Reed
Greene, John P	Duke University	William Beaumont
Grow, Kenneth A	University of Indiana	Letterman
Gulbrandson, Oscar S	Johns Hopkins University	Walter Reed
Hall, Billy A	University of Arkansas	Do
Hill, Thomas M	Vanderbilt University	Letterman
Harshbarger, Rufus R	Duke University	Brooke
Hamilton, Edward L	do	William Beaumont
Hanes, Joe S	Jefferson Medical College	Brooke
Hanson, Victor R	University of Oregon	Fitzsimons
Harris, John F	do	Walter Reed
Harrison, William V	New York University	Do
Hawkins, James C	Washington University	Madigan
Haves, Maurice I	University of Tennessee	William Beaumont
Henderson, James F	Western Reserve University	Fitzsimons
Hess, John W, Jr	Medical College of Virginia	Walter Reed
Hoffman, Frederick J	Washington University	Madigan
Hoe, Joseph H	Medical College of Virginia	Fitzsimons
Hopkins, Alan R	University of Minnesota	Letterman
Hughes, Francis F, Jr	George Washington University	Walter Reed
Johnson, Edward M	St. Louis University	Tripler
Kears, William O	Emory University	Brooke
Kelshberger, Robert F	St. Louis University	Do
Kitchen, Lloyd	Emory University	Tripler

## Army interns—Continued

Name	Medical school	Hospital of Internship
Kokernot, Robert H.	Baylor University	Brooke
Kruse, Francis, Jr.	University of Colorado	Letterman
LaTourrette, Verne G., Jr.	New York Medical College	Fitzsimons
Langsjoen, Per H.	University of Minnesota	Letterman
Lawrence, John C.	Vanderbilt University	Gorgas
Levi, George A.	Medical College of South Carolina	Tripler
Lewis, Charles P., Jr.	Duke University	Brooke
Lindner, Janus C.	Yale University	Walter Reed.
Littman, Maxwell L.	Tulane University	Do.
MacLean, Donald B.	Wayne University	Letterman
Macomber, Peter B.	Harvard University	Madigan
Meeks, Edwin A.	Vanderbilt University	Walter Reed.
Metzger, Joseph F.	George Washington University	Do.
Miller, Gordon B.	University of Southern California	Letterman.
Mizell, Walter S.	University of Arkansas	Madigan
Moore, Carlyle C.	State University of Iowa	Letterman.
Morgan, Francis W.	University of Nebraska	Madigan
Morris, John De L. S.	Cornell University	Walter Reed.
Mott, Richard H., Jr.	George Washington University	Do.
Mounts, Billy W.	Georgetown University	Fitzsimons.
Mueller, Harold W.	University of Nebraska	Letterman.
Munns, Richard E.	University of Kansas	Madigan.
Muth, Jack R.	Syracuse University	Letterman.
McCandless, Dean.	Duke University	Fitzsimons.
McClunahan, Frank C.	University of Nebraska	Gorgas
McClatchy, Sam P.	Bowman Gray University	Tripler
McCleery, Walters, Jr.	Western Reserve University	Do.
McConnell, Bright	University of Georgia	Madigan
McFloy, George R., Jr.	University of Tennessee	William Beaumont
McGee, Robert R.	University of Nebraska	Gorgas
McGrade, Hugh P.	New York Medical College	Letterman
McLeod, Donald G., Jr.	University of California	Tripler
Nahli, Fred J.	Tufts College	Fitzsimons
Naz, John F.	Wayne University	Tripler
Nelson, Robert C.	Western Reserve University	Letterman.
Neyer, John H.	do	Brooke
Nichols, William H., Jr.	University of Georgia	Do.
Nicotri, Benjamin	New York Medical College	Walter Reed.
Nora, James C.	Wayne University	Madigan
Norrell, Milton G., Jr.	College of Medical Evangelists	Letterman.
O'Sullivan, Donald D.	Loyola University	Madigan
Obourn, Robert L.	Washington University	Fitzsimons
Parrish, Matthew D.	George Washington University	Letterman.
Pear, Bertram L.	do	Fitzsimons
Pope, James K.	Bowman Gray University	Letterman
Preston, Charles L.	University of Cincinnati	Walter Reed.
Quinn, Robert E.	Yale University	Do.
Rankin, Richard E.	University of Virginia	Tripler
Reedy, Jack D.	Baylor University	Do.
Reeve, Arnold M.	Wayne University	Brooke
Reister, Philip D.	Washington University	Walter Reed.
Richards, Charles F.	University of Utah	Do.
Richardson, William L.	Duke University	Brooke
Rippy, William D.	do	Walter Reed
Robbette, Joseph S.	University of Arkansas	Brooke
Rose, John C.	Georgetown University	Walter Reed
Sand, Richard F.	Ohio State University	Fitzsimons
Sanderson, George M., Jr.	University of Buffalo	Do.
Scott, Leigh R., Jr.	Emory University	Walter Reed
Sellers, Thomas D.	Duke University	Letterman
Shannon, Karr, Jr.	University of Arkansas	Madigan
Shapiro, Norman D.	University of Tennessee	William Beaumont
Sheehy, James I.	Stanford University	Letterman
Sheffer, Paul W.	University of Illinois	Brooke
Shiles, William R., Jr.	Baylor University	Do.
Silverman, Leo H.	University of Texas	Do.
Simmons, John R.	Boston University	Walter Reed.
Simons, William G.	Ohio State University	Brooke
Slutzky, Gilbert	Wayne University	Gorgas
Smith, Martin E.	Yale University	Walter Reed
Smith, Noel G.	Albany Medical College	Fitzsimons
Smith, Vastal B.	University of Arkansas	William Beaumont
Smith, W. I.	University of Georgia	Brooke
Spilo, Franklin C.	Syracuse University	Do.
Stalker, Daniel F.	Emory University	Do.
Stark, John W.	University of Washington	Letterman
Stephens, William A.	Tulane University	Tripler
Stewart, Robert M.	Duke University	Fitzsimons
Stilgenbauer, Charles	University of Cincinnati	Do.
Stoddard, Darrell C.	Jefferson Medical College	Walter Reed.
Stone, Richardson L.	University of Georgia	Brooke
Stulak, Michael	Tulane University	Do.

## Army interns—Continued

Name	Medical school	Hospital of internship
Switzer, Walter E.	George Washington University	Walter Reed.
Syner, James C.	Boston University	Do.
Ta'ler, Thomas P.	Emory University	Fitzsimons.
Teller, George W.	University of Colorado	Madigan
Tomson, Nathaniel C.	Vanderbilt University	Brooke
Torrance, Jonathan B.	University of Washington	Madigan
Upton, Albert L.	University of Maryland	Letterman.
Van Osdel, Lewis A.	University of Colorado	Fitzsimons
Vineyard, William R.	Washington University	Letterman
Vulter, Frederick E.	Yale University	Walter Reed.
Wagner, Lloyd R.	University of Nebraska	Madigan
Watson, William R., Jr.	University of Pennsylvania	Letterman
Wells, John H.	McHerry Medical College	Madigan
Wemph, Jay N.	Medical College of Virginia	Walter Reed
Wetzel, Howard R.	University of Indiana	Madigan
Wrayne, Harry C.	Tulane University	Walter Reed
Wright, Lloyd T.	University of Illinois	Brooke
Youngs, Harry H., Jr.	Duke University	Do
Zahn, Gregory J.	New York Medical College	Walter Reed
Zelechovsky, Henry T.	Long Island Medical College	Tripler

## Air Force Interns

Adams, Robert H.	University of Kansas	Madigan
Angel, Konrad W.	University of Washington	Walter Reed
Austin, George N.	University of Oklahoma	Do
Bankston, Ingram W.	Alabama Medical College	Letterman
Beasley, Homer L.	Baylor University	Brooke
Benkelms, Ward F.	University of Kansas	Tripler
Bennett, James F.	University of Michigan	Fitzsimons.
Brown, Harry F.	University of Southern California	Tripler
Conn, Fletcher F.	University of Nebraska	Letterman
Crabtree, Sam F.	Alabama Medical College	Tripler
Cranitz, Paul E.	University of Nebraska	Letterman
Crowe, Louis M.	Jefferson Medical College	Madigan
Demlow, Jack H.	University of Indiana	Tripler
Dwyer, Walter W.	Baylor University	Letterman.
Doss, Charles W.	University of Colorado	Do
Donnell, Alonzo M., Jr.	do	Madigan
Dorinson, George	Alabama Medical College	Brooke
Elkie, Clarence G.	Southwestern Medical College	Do
Frysee, Louis A., III	Duke University	Fitzsimons.
George, John W.	University of Indiana	Letterman.
Gillotte, Benjamin W.	Baylor University	Brooke
Goss, Billy	University of Oklahoma	Do
Groover, R. D., Jr.	University of Louisville	Madigan
Hall, Oscar	University of Texas	Brooke
Hart, Douglas M.	do	Gorras
Henson, James P.	University of Georgia	Brooke
Hundley, John C.	Louisiana State University	Do
Jane, John T., Jr.	do	Fitzsimons
Johnson, Chester W., Jr.	University of Minnesota	Gorras
Jones, Frederick B.	Tulane University	Do
Kilmack, Robert M.	University of Georgia	Brooke
Levine, Robert	Ohio State University	Walter Reed
Mann, Edward C.	Tulane University	Do
Marsh, James W.	University of Arkansas	Madigan
Moore, James C.	University of Texas	Brooke
Morgan, Ethelander D., Jr.	Alabama Medical College	Tripler
McKay, William M., Jr.	University of Utah	Madigan
McKuski, Wendell F.	Baylor University	Tripler
Nichols, Thomas A., Jr.	University of Colorado	Fitzsimons
Norton, Arthur T.	St. Louis University	Brooke
Luckett, Ellis F.	University of Louisville	Walter Reed
Raynolds, George F.	University of Michigan	Letterman
Rick, Herbert G.	Harvard University	William Beaumont
Schwartz, Blaud H.	Baylor University	Tripler
Shuler, James A.	Jefferson Medical College	Walter Reed
Simmons, Frederick R.	University of Maryland	Do
Smith, Arthur G.	Syracuse University	Do
Sonensen, Neil E.	University of Southern California	Tripler
Staples, William I., Jr.	University of Georgia	William Beaumont
Turner, David F.	do	Fitzsimons
Usher, George T., Jr.	University of Buffalo	Walter Reed
Touhey, Armand C.	Louisiana State University	Fitzsimons
Wall, William E.	Temple University	Do

# The Station Hospital as a Diagnostic and Treatment Center

WARNER F. BOWERS, *Colonel, MC, U. S. A.*<sup>1</sup>

**A**N INEVITABLE train of events that will greatly increase the importance of the smaller Army hospitals, make assignment there highly desirable, and increase the prestige of medical care at the post level will take place shortly. This end result is one toward which we have been striving and is the goal toward which all of our specialist training has been directed. Soon we can anticipate a well-qualified, highly trained staff in almost all of the clinical specialties at each Army hospital. Before World War II, assignment at such posts as Fort Benning, Fort Riley, Fort Leavenworth, Fort Sill, and many others was considered highly desirable with all of the advantages of quarters and post life. During the war, however, we got into the habit of speaking in terms of thousands of beds and with the wartime evacuation policy, based on shortages of skilled doctors in specialized fields, station hospitals became glorified dispensaries. The connotation thus became fixed that station hospital assignments were for untrained men who could only transfer patients to a general hospital. Unfortunately this was necessary in the early days of the residency training program, but we are about to see a change for the better with the emergence of a fairly large group of trained men available for assignment. No longer will it be necessary to look condescendingly on such an assignment or to threaten resignation at the prospect. In fact, it is predicted that within the next year the emphasis will shift to the point where general hospital assignments will be less sought after than assignment to station hospitals.

Several factors bear on this point. Since there are to be fewer general hospitals, there will be fewer career possibilities in the general hospital system and more trained men will be needed in the station hospitals. As more trained men are assigned to smaller hospitals, a changed evacuation policy will allow any type of treatment to be given

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<sup>1</sup> Office of the Surgeon General, Department of the Army.



values in blood chemistry, normal blood values, cerebro-spinal fluid; and the laboratory tests used in the study of jaundice and liver diseases.

This is an excellent book not only for the internist, surgeon, and general practitioner, but also for the laboratory worker—*Capt. J. L. Schicartz (MC) U. S. A.*

**MITCHELL NELSON TEXTBOOK OF PEDIATRICS**, edited by Waldo E. Nelson, M. D., *Professor of Pediatrics, Temple University School of Medicine, Medical Director of Saint Christopher's Hospital for Children*, with the collaboration of 63 contributors. 5th edition. 1,658 pages. 426 illustrations. W. B. Saunders Co., Philadelphia, Pa., publishers, 1936. Price \$12.

This new edition of a standard text on pediatrics tackles the admittedly difficult problem of encompassing the various aspects of child care in a single volume with admirable thoroughness. Those who are familiar with the fourth edition will find ample evidence of rewriting throughout, with several new names in the list of contributors. The volume contains 306 more pages than the previous edition with new or completely rewritten sections on growth and development; parenteral fluid therapy, drug therapy; anesthesia; congenital malformations; inborn errors of metabolism; the newborn; infection, immunity and allergy; viral diseases, streptococcal infections, histoplasmosis; tumors of the neck, congenital heart disease, the blood; mental deficiency; the endocrine system; bones and joints, muscles, burns, and adolescence. The editor is one of the chief contributors and he has done a monumental job of incorporating the advances of the 3 years between editions in the new volume. The two-column page has been retained for the sake of compactness and ease of reading. Extensive references are given at the end of each section. Several useful appendices appear in the back. An elaborate index which is almost twice the size of that found in the fourth edition is provided.—*Col. W. G. Brandstadt, MC, U. S. A.*

**FOODS AND BEVERAGE ANALYSES**, by Marjorie E. Matthee, A. B., Sc. M., *Assistant Professor of Biochemistry, Graduate School of Medicine, College of Medical Evangelists, Los Angeles, Calif.* formerly Assistant Professor of Pathological Chemistry, Department of Medicine, New York Post Graduate Medical School, Columbia University. Chief Chemist, New York Post Graduate Hospital, Consultant Chemist, Department of Correction Hospitals, City of New York. 3d edition, thoroughly revised. 412 pages. Lea & Febiger, Philadelphia, Pa., publisher, 1930. Price \$5.50.

This third edition of a classical reference is a complete revision of the second which was published in 1925. It more than achieves its objective of providing analytical data on the largest possible number of food factors.

Newer knowledge in the field of human nutrition and the latest in analytical data have been incorporated. Some old material was deleted and considerable rearrangement of the remaining material was undertaken so as to emphasize the changing points of view. This has necessitated a completely different approach from that of classical biochemistry. The inter-relationships and inter-dependency of the more than 40 specific individual factors now recognized as a part of the picture of normal nutrition are carefully delineated throughout the book. Emphasis is laid on variables which affect the nutritive content of foods and the precise requirements of the individual.

The chapter on vitamins has undergone considerable revision and enlargement and covers the subject as thoroughly as the comprehensive nature of this volume permits. Considerable attention has been given to the effect of various kinds of processing upon nutritive values.

There is data on the sodium and potassium content of approximately 500 representative foods and 150 municipal water supplies. Additional tables which have been incorporated include gaseous foods, strained and chopped or junior foods, and Dr. Helen B. Priors' width-weight tables used in establishing a proper concept of expected weight (up to 24 years of age).

There is a 20-page bibliography arranged topically, which should prove very valuable to those in search of more detailed studies of the subjects thus documented.

This book is highly recommended for use as a reference by clinicians, dietitians, nurses, public health and welfare workers, medical students and consultants in diet preparation—*Maj. M. E. Perry, U. S. A. F. (WMSO).*

**RACES.** A Study of the Problems of Race Formation in Man, by Carleton S. Coon, Ph. D., *Curator of Ethnology, University of Pennsylvania Museum, Philadelphia, Pa.*; Stanley M. Garn, Ph. D., *Research Fellow in Anthropology, Forsyth Dental Infirmary for Children, Boston, Mass.*, and Joseph B. Hrdlick, Ph. D., *Assistant Professor of Anthropology, University of California, Los Angeles, Calif.* Publication No. 77 American Lecture Series. 153 pages; illustrated. Charles C. Thomas, Springfield, Ill., publisher, 1950. Price \$3.

This is a very interesting and thought-provoking dissertation in physical anthropology. The authors bring into play many facts and theories relating to the development of the races of man. They highlight the role of natural selection in the production of genotypes and phenotypes and point out the many reasons for their belief that races are developed because of the natural selection which follows mutations. Ninety percent of the 40,000 genes in the human chromosomes control the capacity of the organism for action and reaction to environment, and determine phenotypes, genotypes, and physiologic resistance to disease. Mutations occur because of outbreeding and because of geographic and climatic environment, and technico-cultural advances in a race. In the last chapter they attempt to classify races by types and stock, and present what appears to be a very adequate grouping and classification as well as a physical description of many races.

The physician and dentist, particularly, will find this a very interesting presentation.—*Capt. J. L. Schwartz (MC) U. S. N.*

#### BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, they will be reviewed at a later date.

**PRINCIPLES AND PRACTICE OF PLASTIC SURGERY**, by Arthur Joseph Bursky, M. D., D. D. S., *Attending Plastic Surgeon, Beth Israel Hospital, New York City; Attending Plastic Surgeon, Morrisania City Hospital, New York City; Attending Plastic Surgeon, Bronx Hospital, New York; Attending Plastic Surgeon, Beth El Hospital, Brooklyn, N. Y.*; *Attending Plastic Surgeon, New York State Rehabilitation Hospital, West Haverstraw, N. Y.*; *Clinical Professor of Surgery and Associate Surgeon, New York Polytechnic Medical School and Hospital, American Board of Plastic Surgery, American Society of Plastic and Reconstructive Surgery, American Association of Military Surgeons; Associate Member of British Association of Plastic Surgeons, Associate Member of Mexican Association of Plastic Surgeons; formerly Lieutenant Colonel, MC, U. S.* 499 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$10.

**ESSENTIAL UROLOGY**, by Fletcher H. Colby, M. D., *Chief of the Urological Service, Massachusetts General Hospital; Assistant Clinical Professor of Genito-Urinary Surgery, Harvard Medical School, Boston, Mass.*; *Urological Consultant, Lakeville State Sanatorium, Middleboro, Mass.* 580 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$8.

**1949 YEARBOOK OF OBSTETRICS AND GYNECOLOGY** (October 1948–August 1949), edited by J. P. Greenhill, B. S., M. D., F. A. C. S., *Professor of Gynecology, Cook County Graduate School of Medicine, Attending Gynecologist, Cook County Hospital, Attending Obstetrician and Gynecologist, Michael Reese Hospital, Associate Staff, Chicago Lying-In Hospital.* Author of *Office Gynecology and Obstetrics in General Practice*, Co-author of the *DeLee-Greenhill Principles and Practice of Obstetrics*. 629 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$4.50.

**THE PSYCHOLOGIST IN INDUSTRY** by M F Steiner, *Research Psychologist, Personnel Division General Electric Company, Bridgeport Conn* Publication Number 79, American Lecture Series, 107 pages, Illustrated Charles C Thomas, Springfield, Ill., publishers 1950 Price \$2

**ADMINISTRATION OF SCHOOLS OF NURSING**, by Dorothy Rogers Williams M A, R N, *Lecturer, Administration of Schools of Nursing and Nursing Services, Frances Payne Bolton School of Nursing Western Reserve University, Cleveland, Ohio*, Association of Colleges R N, Professor Emerita . . . . . generally 288 pages, T . . . . . Price \$4

**TRIPS OF ALFRED**, a guidebook for those who must find their way through the mazes of this strange and tantalizing state, by Warren T Vaughan, M S, M D, *Richmond, Va* 3d edition, revised by J. Harvey Black, M D *Dallas Tex* 175 pages Illustrated The C V Mosby Co, St Louis, Mo, publishers 1950 Price \$3.50

**DISEASES OF THE FOOT** by Emil D W Hauser, M S, M D, *Associate Professor of Bone and Joint Surgery, Northwestern University Medical School Attending Orthopedic Surgeon, Passavant Memorial Hospital Chicago* 2d edition, illustrated 415 pages, 195 figures W B Saunders Co Philadelphia Pa publishers 1950 Price \$7

**THE NOSE**, An Experimental Study of Reactions Within the Nose of Human Subjects During Varying Life Experiences by Thomas H Holmes M D *Lester A Hofheimer Research Fellow in Medicine Helen Goodell B S, Research Fellow in Medicine, Stewart Wolf, M D Associate Professor of Medicine, and Harold G Wolf M D Professor of Medicine (Neurology), Cornell University Medical College, New York, N Y* with a foreword by Warfield T Longcope M D *Professor Emeritus of Medicine The Johns Hopkins Medical School, Baltimore Md* 154 pages Illustrated Charles C Thomas Springfield Ill publisher, 1950 Price \$4.50

**ROOT CANAL THERAPY** by Louis I Grossman D D S, *Dental Assistant Professor of Oral Medicine, The Thomas W. Frank Museum and Dental Institute School of Dentistry, University of Pennsylvania* 3d edition thoroughly revised 368 pages 119 illustrations Lea & Febiger Philadelphia Pa publishers 1950 Price \$6.50

**ENDOMYXIA** by Bernhard Gottlieb M D (University of Vienna) D M D Hon (University of Bonn) LL D Hon (Laval University Chicago) *Professor of Oral Pathology and Dental Research Baylor University College of Dentistry, Dallas, Tex* Honorary Member of the American Association of Endodontists, formerly Professor and Head of Department of Histologic Research College of Dentistry University of Vienna Seth Lee Patton, D D S *Assistant Professor of Root Canal Therapy Baylor University College of Dentistry Dallas Tex* and J Hobson Crook D D S *Associate in Dental Research Baylor University College of Dentistry, Dallas Tex* 177 pages Illustrated The C V Mosby Co St Louis Mo publishers 1950 Price \$4

**SURGICAL TREATMENT FOR ABNORMALITIES OF THE HEART AND GREAT VESSELS** by Robert E. Gross M D *William F Ladd Professor of Child Surgery, Harvard University Medical School Boston Mass* The Beaumont Lecture Wayne County Medical Society Detroit Mich 2d printing 72 pages, Illustrated Charles C Thomas Springfield Ill, publisher 1950 Price \$2

**INTRODUCTION TO NEUROPATHOLOGY** by Samuel Pendleton Hicks M D *Departments of Pathology of the Harvard Medical School and the New England Deaconess Hospital formerly Consultant in Neuropathology National Naval Medical Center, and Shields Warren M D Departments of Pathology of the Harvard Medical School and the New England Deaconess Hospital Director of the Division of Biology and Medicine U S Atomic Energy Commission* 1st edition 494 pages Illustrated McGraw Hill Book Co Inc New York N Y publishers 1950 Price \$10

**PROGRESS IN BIOCHEMISTRY**, A Report on Biochemical Problems and on Biochemical Research since 1950 by Felix Haurowitz M D D Sc *Professor of Chemistry Indiana University Bloomington Ind* Interscience Publishers Inc New York N Y publishers 1950 Price \$7.50

**BRUCELLOSIS (Undulant Fever)** (Clinical and Subclinical) by Harold J Harris M D, F A C P with the assistance of Blanche I Stevenson R N Foreword by Walter M Simpson M S M D F A C P 2d edition revised and enlarged 617 pages 111 illustrations 12 in full color Paul B Hoeber Inc New York, N Y, publisher 1950 Price \$10

- HANDBOOK OF OBSTETRICS AND DIAGNOSTIC GYNECOLOGY**, by Leo Doyle, M. S., M. D. Illustrations by Ralph Sweet. 240 pages; illustrated. University Medical Publishers, Palo Alto, Calif., publishers, 1950. Price \$2.
- A SHORT HISTORY OF PHYSIOLOGY**, by Kenneth J. Franklin, D. M., F. R. C. P., *Professor of Physiology at the Medical College of St. Bartholomew's Hospital*. 2d edition. 147 pages; illustrated. Staples Press, New York, N. Y., publishers, 1950. Price \$2.
- OCCUPATIONAL THERAPY, Principles and Practice**, edited by William Rush Dunton, Jr., M. D., *Founder and Former Editor, Occupational Therapy and Rehabilitation*, and Sidney Licht, M. D., *Editor, Occupational Therapy and Rehabilitation*. 321 pages, illustrated. Charles C Thomas, Springfield, Ill., publisher, 1950. Price \$6.
- TREATMENT IN PSYCHIATRY**, by Oskar Diethelm, M. D., *Professor of Psychiatry, Cornell University Medical College, Psychiatrist-in-Chief, The New York Hospital (Payne Whitney Psychiatric Clinic)*. 2d edition. 574 pages. Charles C Thomas, Springfield, Ill. publisher, 1950. Price \$8.50.
- UROLOGICAL SURGERY**, by Austin Ingram Dodson, M.C., F. A. C. S., *Richmond, Va., Professor of Urology, Medical College of Virginia, Urologist to the Hospital Division, Medical College of Virginia, Urologist to Crippled Children's Hospital, Urologist to St. Elizabeths Hospital; Urologist to St. Luke's Hospital and McGuire Clinic*, with 12 contributors. 2d edition. 855 pages, 645 illustrations. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$13.50.
- TEXTBOOK OF BACTERIOLOGY**, by Joseph M. Dougherty, A. B., M. A., Ph. D., *Dean of the School of Science and Professor of Bacteriology, Villanova College, Fellow of the American Association for the Advancement of Science*, and Anthony J. Lambert, B. S., M. S., *Instructor in Bacteriology and Parasitology, Temple University School of Medicine; formerly Instructor in Bacteriology, Villanova College, Member of the American Public Health Association*. 2d edition. 491 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., publisher, 1950. Price \$5.75.
- THE PATHOLOGY OF ARTICULAR AND SPINAL DISEASES**, by Douglas H. Collins, O. B. E., M. D. (Liverpool); *Reader in Clinical Pathology in the University of Leeds. Formerly Rheumatism Research Fellow in the University of Leeds, L. M. S. Pathologist and Medical Superintendent, Wharfedale Hospital, Sheffield. Junior Lecturer and Hall Fellow in Pathology in the University of Liverpool*. 331 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$7.
- GYNECOLOGY, The Teachings of John I. Brewer**, by John I. Brewer B. S., M. D., Ph. D., *Professor of Obstetrics and Gynecology, Northwestern University Medical School, Chief of Gynecology and Obstetrics, Passavant Memorial Hospital, Chicago*. 457 pages, illustrated. Thomas Nelson & Sons, New York, N. Y. publishers, 1950. Price \$7.50.
- THE 1949 YEARBOOK OF ORTHOPEDICS AND TRAUMATIC SURGERY** (October 1948–November 1949), edited by Edward L. Compere, M. D., F. A. C. S., *Associate Professor of Surgery, Northwestern University Medical School, Chairman, Departments of Orthopedic Surgery, Wesley Memorial and Children's Memorial Hospitals. Consultant Orthopedic Surgeon, Chicago Memorial Hospital, Consultant in Orthopedics, U. S. Naval Hospital, Great Lakes*. Ill. 464 pages, illustrated. The Year Book Publishers, Inc. Chicago, Ill., publishers, 1950. Price \$5.
- MEDICAL MANAGEMENT OF GASTROINTESTINAL DISORDERS**, by Garnett Cheney, M. D. *Clinical Professor of Medicine, Stanford University Medical School*. 478 pages. 29 figures. The Year Book Publishers, Chicago, Ill., publishers. 1950. Price \$6.75.
- TRANSACTIONS OF THE AMERICAN GOITER ASSOCIATION** 1949 Annual Session May 26, 27–28, Hotel Lorraine Madison Wis. 460 pages. Illustrated. Charles C Thomas, Springfield, Ill. publisher. 1950. Price \$10.50.
- A PRIMER OF VASCULAR PRESSURE**, by George E. Burch, M. D. *Henderson Professor of Medicine, Tulane University School of Medicine. Senior Visiting Physician, Charity Hospital. Consultant in Cardiovascular Diseases, Oschner Clinic, Visiting Physician, Tufts Infirmary, New Orleans*. 174 pages, illustrated. Lea & Febiger, Philadelphia, Pa., publisher. 1950. Price \$4.

**OFFICE ORTHOPEDICS**, by Lewis Cozen, M. D., F. A. C. S., *Attending Orthopedic Staff The Orthopedic Hospital, Veterans Hospital, Los Angeles County Hospital, Cedars of Lebanon Hospital, Los Angeles, and Los Angeles Tuberculosis Sanitarium, Monrovia, Calif.*, Assistant Professor of Orthopedic Surgery, College of Medical Franchists, Los Angeles 232 pages, 156 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1950 Price \$5

**THE 1949 YEAR BOOK OF DRUG THERAPY**, November 1948-October 1949 edited by Harry Beckman, M. D., *Director, Department of Pharmacology, Marquette University School of Medicine* 718 pages; 133 figures The Year Book Publishers, Inc., 200 East Illinois Street, Chicago 11, Ill., publishers, 1950 Price \$4.75

**POSTGRADUATE GASTROENTEROLOGY**, as Presented in a Course Given Under the Sponsorship of the American College of Physicians in Philadelphia, December MCMXLVIII Edited by Henry L. Bokius, M. D., *Professor of Gastroenterology, University of Pennsylvania Graduate School of Medicine* 670 pages; 238 figures W. B. Saunders Co., Philadelphia, Pa., publishers, 1950 Price \$10

**A MANUAL OF CARDIOLOGY**, by Thomas J. Dry, M. A., M. B., Ch. B., M. S. in Medicine, *Associate Professor of Medicine University of Minnesota (Mayo Foundation), Consultant in Section on Cardiology Mayo Clinic* 2d edition 355 pages, illustrated W. B. Saunders Co., Philadelphia, Pa., publishers, 1950 Price \$5

**THROMBOSIS IN ARTERIOCLEROSIS OF THE LOWER EXTREMITIES** Publication No. 41 American Lecture Series, by Edward A. Edwards M. D., F. A. C. S., *Diplomate of American Board of Surgery, Clinical Associate in Anatomy, Harvard Medical School, Instructor in Surgery, Tufts College Medical School, Consultant in Peripheral Vascular Disease Joseph H. Pratt Diagnostic Hospital and Hospital of the Massachusetts Soldiers' Home Chief of Vascular Clinic, Boston Dispensary* 74 pages illustrated Charles C. Thomas, Springfield, Ill., publisher, 1950 Price \$2

**MEDICAL GYNECOLOGY**, by James C. Janney M. D., F. A. C. S., *Associate Professor of Gynecology, Boston University School of Medicine, Associate Visiting Gynecologist, Massachusetts Memorial Hospitals* 2d edition 454 pages, illustrated W. B. Saunders Co., Philadelphia, Pa., publishers, 1950 Price \$6.50

**CLINICAL NUTRITION**, edited by Norman Jolliffe, M. D., F. P. Tisdall, M. D., and Paul R. Cannon M. D., for the Food and Nutrition Board of the National Research Council 925 pages, illustrated Paul B. Hoeber, Inc., New York N. Y., publisher, 1950 Price \$12

**BIBLIOGRAPHY OF OCCUPATIONAL MEDICINE** Vol. 1 1948 Published by International Labor Office Geneva Switzerland Price \$1

**NEW DISCOVERIES IN MEDICINE THEIR EFFECT ON THE PUBLIC HEALTH** by Paul R. Hawley 194 pages, illustrated Columbia University Press, New York N. Y., publishers, 1950 Price \$2.50

**QUINIDINE IN DISORDERS OF THE HEART** by Harry Gold M. D., *Professor of Clinical Pharmacology at Cornell University Medical College, Attending in Charge of the Cardiovascular Research Unit at the Beth Israel Hospital, Attending Cardiologist at the Hospital for Joint Diseases, Managing Editor of the Cornell Conference on Therapy* 115 pages Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950 Price \$2

**A TEXTBOOK OF DENTAL ANATOMY AND PHYSIOLOGY**, by Russell C. Wheeler D. D. S., F. A. C. D., *Associate Professor of Anatomy at Washington University School of Dentistry, St. Louis* 2d edition 422 pages illustrated W. B. Saunders Co., Philadelphia, Pa., publishers, 1950 Price \$6.75

**WATER AND SALT DEFICIENCY** by H. L. Marlott, C. B. L. M. D., F. R. C. P., *Middlesex Hospital London England* Publication No. 32 American Lecture Series. 80 pages Charles C. Thomas, Springfield, Ill., publisher 1950 Price \$2

**PROCEEDINGS OF THE FIRST CLINICAL ACTH CONFERENCE** edited by John R. Mote M. D. 607 pages illustrated The Blakiston Co., Philadelphia Pa., publishers 1950 Price \$5.50

- THE 1949 YEAR BOOK OF UROLOGY**, edited by Oswald S. Lowsley, M. D., F. A. C. S., Director, James Buchanan Brady Foundation New York Hospital; Visiting Urologist, St. Clare's Hospital, Consulting Urologist, Hospital for Ruptured and Crippled, Poughkeepsie Hospital, etc.; Member, International Urological Association, Pan-American Medical Association, Pan-American Medical Confederation, International College of Surgeons, Officer of the National Order of Merit and Honor of Haiti. 445 pages; 62 figures. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$5.
- OPERATIVE SURGERY**, by various authors. Edited by Alexander Miles, M. D., LL. D., F. R. C. S. (Ed.), Consulting Surgeon, The Royal Infirmary, Edinburgh, and Sir James Learmonth, K.C.V.O., C. B. E., Ch. M., F. R. C. S. (Ed.), Regius Professor of Clinical Surgery and Professor of Surgery, University of Edinburgh. 3d edition. 559 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price \$6.50.
- HORMONES IN CLINICAL PRACTICE**, by H. L. Nieburg, M. D., Research Associate, Department of Endocrinology, and Assistant Professor, Department of Oncology, University of Georgia; Late Research Endocrinologist, Department of Obstetrics and Gynecology, British Post-Graduate Medical School, and Clinical Assistant, Endocrine Clinic, Westminster Hospital, London. 386 pages, illustrated. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price \$5.50.
- THE 1949 YEAR BOOK OF NEUROLOGY, PSYCHIATRY AND NEUROSURGERY** (December 1948–October 1949). **NEUROLOGY** edited by Roland P. Mackay, M. C., Professor of Neurology, University of Illinois; Attending Neuropsychiatrist, St. Luke's Hospital, Chicago. **PSYCHIATRY** edited by Nolan D. C. Lewis, M. D., Director, New York State Psychiatric Institute and Hospital, Professor of Psychiatry, Columbia University. **NEUROSURGERY** edited by Percival Bailey, M. D., Distinguished Professor of Neurology and Neurological Surgery, University of Illinois. 668 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$5.
- EXHIBITIONISM**, by N. K. Rickles, B. S., M. D., Fellow of the American Psychiatric Association, Diplomate of the American Board of Psychiatry and Neurology, Senior Consultant at the Veterans' Administration Center, Los Angeles, Consultant in Psychiatry to the Office of the Surgeon General, Medical Department, United States Army; and Director of the Psychiatric Center of Seattle. 108 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$5.
- THE ARMY OF ISRAEL**, by Moshe Pearlman. 256 pages; illustrated. Philosophical Library, New York, N. Y., publishers, 1950. Price \$5.
- PRACTICAL STATISTICS IN HEALTH AND MEDICAL WORK**, by Ruth Rice Puffer, Dr. P. H., Tennessee Department of Public Health, with foreword by Hugo Muench, M. D. 238 pages, illustrated. McGraw-Hill Book Co., Inc., New York, N. Y., publishers, 1950. Price \$3.75.
- HARVEY CUSHING**, Surgeon, Author, Artist, by Elizabeth H. Thomson. Foreword by John P. Fulton. 347 pages, illustrated. Henry Schuman, Inc., New York, N. Y., publisher, 1950. Price \$4.
- COAGULATION, THROMBOSIS, AND DICHTHROMBOL**, with an Appendix on Related Laboratory Procedures, by Shepard Shapiro, M. D., Assistant Professor of Clinical Medicine, New York University College of Medicine; Visiting Physician, Third (New York University) Medical Division, Goldwater Memorial Hospital. Associate Physician, Lincoln Hospital and Murray Weiner, B. S., M. S., M. D., Fellow in Medicine, New York University College of Medicine, Research Assistant, Third (New York University) Medical Division, Goldwater Memorial Hospital, Assistant Visiting Physician, Willard Parker Hospital Chest Service, Clinical Assistant Visiting Physician, Bellevue Hospital. 131 pages. Brooklyn Medical Press, New York, N. Y., publishers, 1950. Price \$5.50.
- 1949 YEAR BOOK OF DERMATOLOGY AND SYPHILIGOLOGY**, edited by Marion B. Sulzberger, M. D., Professor and Chairman, Department of Dermatology and Syphilology, Post Graduate Medical School; Director of Dermatology and Syphilology, Skin and Cancer Unit and University Hospital, New York University-Belleue Medical Center, and Rudolf L. Baer, M. D., Assistant Professor of Clinical Dermatology and Syphilology, Post Graduate Medical School, Attending Skin and Cancer Unit, New York University-Belleue Medical Center. 514 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$5.







*The Journal* is indexed in  
the following publications:

*Current List of Medical Literature*

(Army Medical Library) Weekly listings of  
journal contents by author; subject index  
monthly.

*Quarterly Cumulative Index Medicus*

(American Medical Association) Author and  
subject

*Index Catalogue of the Library of the Surgeon  
General's Office, U. S. Army*

(Army Medical Library) Now in Fourth Series,  
Vol X, Letter M (first half). Author and  
subject

**COVER PHOTOGRAPH**  
*National Naval Medical Center*  
*Bethesda, Md.*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books, of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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THE ARMED FORCES INSTITUTE OF PATHOLOGY

One of the outstanding contributions to military medical science and to the nation's medical progress has been the Army Institute of Pathology. It has developed with the growth of medicine in this country and has rendered an essential service to the military forces, other Government agencies, and medical practice generally.

Its work long ago outgrew the physical facilities provided for it. Efforts have been made over a period of many years to provide adequate new housing.

On 21 February 1949, following study and recommendations by the Armed Forces Medical Advisory Committee, the Secretary of Defense redesignated this institution the Armed Forces Institute of Pathology and directed that plans be submitted for a new and complete building to accommodate it.

Early in 1950, the Congress passed and the President approved Public Law 495, 81st Congress, authorizing the construction of an Armed Forces Institute of Pathology and the expenditure of \$350,000.00 for the preparation of final plans, with the Institute to be located at the Army Medical Center, Washington, D. C. The final realization of this project will be a tribute to the high professional standards of the Armed Forces and to the military and civilian medical men whose foresight and long labor made it possible.

*Richard L. Meiling*

Richard L. Meiling, M. D.  
Director of Medical Services





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## Field Training of Army Medical Officers

RAYMOND W. BLISS, *Major General, U. S. A.*<sup>1</sup>

EXAMINATION of our history and that of other great nations will reveal that major wars have occurred about every 20 to 25 years. These wars last from 2 to 4 years. If this state of affairs continues most doctors will probably experience two wars in their professional lifetime. Thus one-fifth to one-sixth of a doctor's professional life will be in a wartime practice.

An essential mission of the Medical Department is the preparation for the support of the combatant arms under wartime conditions. In the transition period following World War II the training desirable for this preparation has not been stressed. We have relied on the fact that most of our Regular Army officers had received ample training during the last war period. The changing concept of future warfare, organizational changes, and the constant development of new weapons of offense and defense make it advisable to bring these more experienced officers up to date. In the Regular Army Medical Corps we have an ever-increasing number of physicians who do not have war experience.

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<sup>1</sup> Surgeon General, U. S. Army.

The unique features of medical practice required for the maintenance of health, prevention of disease and injury, and the care and rehabilitation of casualties under wartime conditions should be an important part of every medical officer's training. Orientation courses and other training in these subjects should be given early in a medical officer's career. This training is in addition to the usual residency and practical studies leading to proficiency in curative methods and toward certification by an American specialty board although it is believed that when it is properly developed the two will be closely intermingled. This type of training should increase a doctor's competence and appreciation of the professional requirements needed in a medical service during war.

There should be an early close correlation of professional medicine and the elements of administrative, staff, and command duties. By intelligent exposure doctors will undoubtedly emerge with special interest and talent in administrative, staff, and command work. They should be encouraged. These officers should be allowed to specialize, *receiving opportunity for recognition and advancement equal to those of officers in any other chosen career field.* With this concept in mind we should expect our specialized medical field personnel to be better trained and more actively interested in the aspects of military medicine. Conversely, our specialists in curative and preventive medicine would know the specific phases required in war and be reasonably well versed in medical field duties dealing with administration, staff, and command.

Using the previously described methods, we hope to develop capable medical officers for field duty with a constructive interest in their field of endeavor. This should give adequate medical support to field commanders and provide trained personnel for medical services in the field.

In order to aid us in meeting this need, authorization has been secured to start the Medical Department Company Officers' Course this fall. Phase I of this course will be given at the Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex., and Phase II at the Army Medical Department Research and Graduate School, Washington, D. C. Phase I will open 5 September 1950 and close 2 February 1951. Phase II will open 12 February 1951 and close 20 June 1951. In addition to medical officers, dental, veterinary, and Medical Service Corps officers will attend Phase I. Only medical officers will attend Phase II.

It is planned that each officer entering the Medical Corps will have the opportunity of taking this course. Phase I will provide basic branch training to officers so that they will be thoroughly grounded

in the duties and responsibilities appropriate to company grade Medical Department officers. Phase II will provide instruction in the unique aspects of military medical practice required to supplement basic medical knowledge in the prevention, treatment, and rehabilitation of casualties as they occur in war.

This course should come as early in an officer's career as possible, preferably immediately after he has been commissioned in the Regular Army. The course should be followed by a period in which he can apply his instruction. During this period, which will usually not exceed 2 years, his duties may include assignment to a tactical medical unit. While undergoing this training in Army field medicine, he will learn the matériel and personnel means with which he will have to work in fulfilling his mission as an army field surgeon in the medical command and staff career. He will become acquainted with the rudiments of the tactics of the unit with which he serves. Most important, he will be learning to practice his profession under field conditions.

Later, between his fifth and twelfth years of service, each officer will have the opportunity to attend the advanced course at the Medical Field Service School, Brooke Army Medical Center. This course is designed to provide instruction in the light of war lessons and modern developments to insure effective development of all Medical Department units within the framework of the Department of the Army. Efficient medical support of military forces includes orientation in the organization and employment of divisions, corps, field armies and the related medical, dental, and veterinary services. Instruction is presented primarily from a staff and command viewpoint. This may be followed by a tour of duty as a division or corps surgeon, or duty in the office of an army or theater surgeon, or in the medical section of the Office, Chief of Army Field Forces.

The atomic era is here with its possibilities for producing enormous numbers of military and civilian casualties. This demands that every Regular Army Medical Department officer be fully trained in the peace years in the procedures applicable to the medical control and supervision of large scale disasters.

It is anticipated that enough officers to fulfill all requirements will become interested to the point of electing Army Field Medicine as a career. In peacetime only a few specialists in this field are required. They will consist of carefully selected officers who wish to follow this course and who show special aptitude for it. The career contemplated for medical command and staff officers will consist of attendance at certain service schools whose courses are of particular interest to the Medical Department. Specifically these are: (a) The Medical Field Service School; (b) The Infantry School at Fort Benning, Ga., The Artillery School at Fort Sill, Okla., or the Armored School at

Fort Knox, Ky.; (c) a post-graduate course in preventive medicine at the Army Medical Department Research and Graduate School; (d) The Command and General Staff College at Fort Leavenworth, Kans., (e) The Armed Forces Staff College at Norfolk, Va.; (f) The Army War College, The Industrial College of the Armed Forces; and (g) The National War College.

These school periods will be alternated with applicatory tours of duty with field medical units and refresher professional assignments in Army hospitals. This last item is considered of particular importance, for it is essential that medical command and staff officers keep fully abreast of every element of medical progress. Final goals for these officers will be such assignments as army or theater surgeons, instructors at one of the special or general service schools, duty in the medical section of the Office, Chief of Army Field Forces, or in one of the divisions of the Surgeon General's Office, or similar staff positions.

This is a brief outline of the instruction and training that is planned in order to prepare medical officers for their duties in Army Field Medicine. It also outlines in general the career that will be offered to those few carefully selected officers who show special aptitude and a desire to specialize in Army Field Medicine.



# Fundamentals in the Use and Preservation of Homogenous Bone

GEORGE W. HYATT, *Lieutenant (MC) U. S. N.*<sup>1</sup>

THE present-day use of preserved grafts of homogenous bone was fostered by Bush and Garber (3) in 1945. The large number of bone banks in existence today attests to their clinical value. There is little doubt that the principles of bone preservation and the surgical application of preserved bone is a permanent although, as yet, undetermined advance in orthopedics.

The physician in charge of a bone bank who does not appreciate the fundamentals of supervision will find that not only will such a bone bank fail to be of value, but also that the clinical failures that will occur may greatly delay acceptance of a fundamentally satisfactory procedure in orthopedic surgery.

One major disadvantage of the present-day methods is the lack of unequivocal control of the asepsis of the deposit. The culture of a single specimen is inadequate and proper bacteriologic determination requires culture of the entire bone graft. Therefore, some institutions rely solely upon donor wound healing as the criterion for an acceptable bone deposit. Both of these methods have disadvantages but they have proved to be clinically worthwhile in the hands of many surgeons.

The development of a simple method of sterilizing bone grafts which would not materially damage the osteogenetic properties of the deposit or so alter it as to make it unsatisfactory in osteosynthesis would be a signal advance.

It is estimated that although frozen homogenous bone is approximately 15 to 50 percent slower in final healing than its autogenous counterpart, the end results are identical (1). Key (2) observed that procurement of an autogenous bone graft increases the gravity

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of the operative procedure about one-third. The experimental and clinical work relating to homogenous bone grafts by Bush and Garber (3), Wilson (4), Walsh (5), Lapscomb (6), Weaver (7), Reynolds and Oliver (8), Inclan (9), and Zimbron (10) indicated that the present methods of chemical and refrigerative preservation are most satisfactory. However, these present-day methods of bone preservation are only milestones in the quest for a bone graft substitute that will be perfectly and quickly revascularized, completely acceptable to the host, and readily available.

#### HISTORY

In 1867 Ollier (11) published his treatise on bone formation. His experimental and clinical observations are the basis of autogenous bone grafting as we know it today. We find the first reference to the value of refrigeration in the preservation of bone when he determined that temperatures of less than  $-16^{\circ}\text{C}$ . ( $3.2^{\circ}\text{F}$ .) delayed putrefaction of bone. He also found that rabbit bone kept at  $-1^{\circ}\text{C}$ . ( $30.2^{\circ}\text{F}$ .) gave a growth of bone four times greater than that of rabbit bone kept at  $5^{\circ}$  to  $10^{\circ}\text{C}$ . ( $41.0^{\circ}$  to  $50.0^{\circ}\text{F}$ .). He also commented on the practicality of using cadaver bone in human bone grafting.

Tuffier (12), in 1910 and 1911, preserved, in an ordinary ice box, pieces of human fat, bone, cartilage, and peritoneum which had been placed in petrolatum. Although there are several references in this older literature to the clinical use of this refrigerated human cartilage and peritoneum, it was noted that portions of dog periosteum, which had been kept in cold storage for from 24 to 48 hours, when transplanted under the skin of the chest of another dog would produce bone. In this same period Albee (14) published one of the first standards for the preservation of homogenous grafts, the graft was to be either immersed in petrolatum or wrapped in sterile petrolatum gauze and placed in storage at a temperature of  $4^{\circ}$  to  $5^{\circ}\text{C}$ . ( $39.2^{\circ}$  to  $41.0^{\circ}\text{F}$ .). He considered freezing undesirable as "the resultant contraction and expansion damage the cellular content of the graft" (15). Fresh and cadaver bone were successfully used after chilling for from 24 to 48 hours. That these principles have gained partial acceptance in orthopedic centers can be verified by their inclusion in the Medical Manual No. 4, Military Orthopedic Surgery (World War I).

In 1918, Groves (16) reported that there had been sufficient success in the use of chilled homogenous grafts to justify their employment in selected cases if the correction of a defect included all or part of the cartilagenous articular surface of the long bones. He noted that such a graft should have the articular configuration necessary for proper modeling and recommended that the graft be obtained

from a cadaver free from infectious disease; preferably one whose death was caused by trauma. After the graft was taken, it was to be cultured and placed in a sterile receptacle in an ice chest and after 24 hours, if the culture was negative, the graft could be used. These concepts are remarkably parallel to the present use of frozen cadaver bone.

The recommended practices of Albee and Groves did not seem to gain general acceptance, possibly because of the difficulties of procurement and of preservation. No further reports on the clinical use of bone preserved by chilling or freezing appeared in the literature until late in World War II.

In 1934, Keith (17) noted "survival" of some cells with new bone formation, following immersion of fragments of dog bone for 10 minutes in liquid air. A similar result was obtained with implantation of dog carpal and tarsal bones frozen for 10 minutes in liquid air.

Between 1931 and 1937, Orell (18) published his work on preserved heterogenous bone. He defined *os purum* as bone which, through a lengthy physiochemical process, was freed of fat, connective tissue, and protein; however, it was not entirely freed of all collagenous matrix. *Os novum* was then produced by subperiosteal implanting with subsequent grafting after 1 to 2 months.

In 1937, Smith (19) reported two successful homogenous grafts in nonunion of fractures in osteogenesis imperfecta. The bone was refrigerated for preservation and autoclaved immediately before use.

Inclan (9) in 1942, was the first to utilize refrigeration in the preservation of homogenous bone for an appreciable number of bone grafts. He utilized these preserved homogenous grafts in 8 cases, 6 of which were successful; preserved autogenous bone was used for the remaining 46 grafts. The transplant was placed in a sterilized glass container and covered with the patient's own blood or that of a donor of the same group. The maximum preservation time was 63 days. The minimum was 3 days and good or excellent results were obtained in approximately 75 percent of the cases.

In 1942, Smith (20) employed homogenous bone refrigerated 18 days with apparently satisfactory results.

The advent of better refrigeration methods and the mass production of antibiotics proved to be a great stimulus to bone graft surgery and resulted in the increased use of frozen bone transplants.

A type of frozen-bone bank was initiated by Bush and Garber (3) (21) in 1945. It was prompted by a need for additional bone for orthopedic procedures involving extensive spinal fusions for severe scoliosis, low back disorders, filling of bone cysts, and the replacement



of other benign defects in bone. At first, bone was preserved at temperatures ranging from  $-2^{\circ}$  to  $-5^{\circ}$  C. ( $28.4^{\circ}$  to  $23.0^{\circ}$  F.); however, it was observed that bone could be preserved for only 2 or 3 weeks. Following experimental studies in animals it was found that  $-24^{\circ}$  C. ( $-11.2^{\circ}$  F.) was probably the optimum temperature for prolonged preservation of bone for grafting purposes. In 126 procedures in which the frozen homogenous graft was used, they noted 2 infections, 1 fracture of an onlay graft, and 1 failure because of inadequate soft tissue coverage. In an effort to maintain strict asepsis, the fresh graft (without preservative) was placed in a double jar (a small jar within a large one) and covered with a sterile rubber dam.

Subsequently, Wilson (4) reported 30 surgical procedures in which fresh bone without preservative added was placed in a single sterile sealed jar and frozen at  $-22^{\circ}$  to  $-30^{\circ}$  C. ( $-7.6^{\circ}$  to  $-22.0^{\circ}$  F.). No infections were reported and in all cases "its behavior seemed to be identical to that of the fresh autogenous bone." At a later date, Wilson reported over 200 cases of the clinical use of frozen bone with satisfactory results; the infection rate was approximately 2 percent.

Walsh (5), working independently, presented a similar method of preserving bone by refrigeration. This work is the best review of the fundamentals of the use of freezing temperatures in the prolonged preservation of bone.

The impetus given to the use of frozen bone by the previous workers cannot be underestimated. In 5 years, the bone bank has grown from an experiment to an established orthopedic practice, even though the indications for the use of frozen bone are subject to limitations.

#### THE ACTION OF REFRIGERATION IN THE PRESERVATION OF BONE

According to Walsh (5) the changes which occur in stored bone may be classified into two groups: (a) biochemical changes in the activity of the enzymes of the bone itself; and (b) changes due to the action of putrefactive bacteria. To this may be added (c) changes in the bone due to mechanical action of freezing.

Lipscomb (6) has demonstrated that alkaline phosphatase activity is demonstrable after 2 to 3 weeks of bone storage at temperatures of  $-10^{\circ}$  C. ( $14.0^{\circ}$  F.). Gross, histologic, and chemical examinations following experimental procedures in rabbits indicate that the activity of this enzyme has no notable effect upon the final healing of the frozen bone graft. Frozen specimens examined grossly, microscopically, and by olfaction revealed no evidence of putrefaction. Weaver (7) who has used frozen homogenous bone successfully after 308 days' storage in an ordinary ice-cream cabinet noted no gross changes. Walsh found that bone removed aseptically from an ampu-

tated limb and stored for 10 months at  $-22^{\circ}$  C. ( $-7.6^{\circ}$  F.) revealed no gross changes.

It is possible that partial protein denaturation occurs in the bone as a direct result of freezing. Hardy (22) observed that gels, which were singularly refractive to polarized light previous to freezing, became doubly refractive during the frozen state. It is known that "freezing and thawing alter the configuration of colloidal systems whether gels of sols and the resulting structures depend upon the rate of freezing" (23). This is evidence that the colloidal molecular structure impairment is permanent. In a bone transplant, autogenous or homogenous, it is possible that the organic fraction of the calcium proteinate may be an important factor in facilitating the subsequent revascularization of the graft. Perhaps freezing alters the osseous protein and if we consider that the majority of all transplant grafts die, this may explain the estimated 15 to 50 percent delay in healing after the use of frozen bone grafts. Moran (23) has noted that the temperature at which the mixture of colloid and ice forms must be lower than the external temperature due probably to the low diffusibility of the colloid complexes. Hardy (22) found that gels at 65.6 percent concentration could not be made to freeze.

These observations have been applied to frozen bone on the basis that bound water is intracellular and cannot be frozen; and interstitial water is not so bound to protein and hence can be frozen (22). Further the internal friction increases as the colloid concentration increases and as the temperature falls. This is the result of the inability of ice-forming sources to overcome internal friction (22) and this prohibits intracellular freezing. Stiles (24) believes that the cellular death of the tissue kept at freezing temperature occurs because of formation of ice crystals which alter the space relation of the phases constituting the normal colloid complex of protoplasm.

On the basis of the foregoing, we may conclude that, at the usual bone bank temperatures, freezing of bound water does not occur nor is there serious protein denaturation, and since the potential value of any graft conceivably exists in the protein fraction of the calcium proteinate, the physiologically important protein fractions of the donor bone are preserved. This explanation may be the reason that bone grafts can be preserved by freezing (fig. 1) and in addition offers an explanation for the delay in final bone healing when using frozen bone.

Strumia, McGraw, and Reichel (25) have given additional proof of the relationship of cold to colloid preservation by demonstration that, under refrigeration, it is possible to retain the physiochemical properties of complex colloids. The essential conditions are rapid

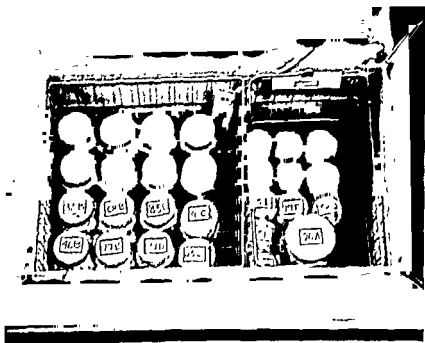


Figure 1.—A typical bone bank.

freezing, maintenance of a temperature below  $-15^{\circ}\text{C}$ . ( $5.0^{\circ}\text{F}$ .), and rapid thawing followed by a quick warming to  $98^{\circ}\text{F}$ . They also stated that plasma stored at  $4^{\circ}\text{C}$ . ( $39.2^{\circ}\text{F}$ .) gradually lost the entire protein fraction; however at  $-15^{\circ}\text{C}$ . ( $5.0^{\circ}\text{F}$ .) this did not occur. Funn (27) has shown that the protein of juice of muscle stored at  $-1^{\circ}$  to  $-3^{\circ}\text{C}$ . ( $30.2^{\circ}$  to  $26.6^{\circ}\text{F}$ .), underwent denaturation of protein up to 10 percent of the volume. If muscle juice was stored at  $-20^{\circ}\text{C}$ . ( $4^{\circ}\text{F}$ .), only 1 percent was denatured; this occurred early and remained constant up to 75 days. Of course, bone protein is not exactly the same as that of blood and muscle juice, however, fundamentally similar proteins tend to follow the same chemical laws.

It appears, therefore, that the optimum temperature for prolonged bone preservation is in a range with a minimum of  $-15^{\circ}\text{C}$ . ( $5.0^{\circ}\text{F}$ .) and the maximum so much colder that it is yet to be determined.

#### EFFECT OF REFRIGERATION ON BACTERIA

Haines (26) has demonstrated that the critical zone for bacterial survival lies in the temperature range of  $-1^{\circ}$  to  $-2^{\circ}\text{C}$ . ( $30.2^{\circ}$  to  $28.4^{\circ}\text{F}$ .). The date of death at  $-1^{\circ}\text{C}$ . ( $30.2^{\circ}\text{F}$ .), was definitely more rapid than at  $-5^{\circ}\text{C}$ . ( $23.0^{\circ}\text{F}$ .); there was little variance in the death of the bacteria evaluated. No evidence has been presented that

a bactericidal effect is associated with the rapidity of the freezing process. The sensitivity of bacteria to cold varies greatly; for example, a suspension of *Bacillus pyocyaneus* frozen rapidly to  $-70^{\circ}$  C. ( $-94.0^{\circ}$  F.), when thawed showed that approximately 80 percent of the organisms had been killed. Similar treatment of *Bacillus mesentericus* (a spore-former) killed none.

Turner (28) has demonstrated that spirochetes are only slightly adversely affected by temperatures as low as  $-78^{\circ}$  C.; however, at higher temperatures,  $-10^{\circ}$  to  $-20^{\circ}$  C. ( $14.0^{\circ}$  to  $4.0^{\circ}$  F.), loss of the spirochetes occurred during storage periods.

As a rule, viruses placed in glycerin and maintained at freezing temperatures will remain virulent for a number of weeks; however, there seems to be a considerable fall in titer from that of the fresh specimens. Viruses, such as human influenza, yellow fever, and certain types of encephalomyelitis when frozen and maintained at  $-78^{\circ}$  C., have substantially the same titer after 6 months.

The personal experiences of the author and Dr. A. D. Kenton<sup>2</sup> showed that stock cultures of hemolytic *Staphylococcus aureus* and hemolytic streptococci when placed in the bone bank and kept at  $-20^{\circ}$  to  $-30^{\circ}$  C., revealed a heavy growth of organisms when cultured at weekly intervals for 4 weeks and monthly intervals for 6 months.

From this evidence, it is apparent that the temperature required for adequate bone preservation is bacteriostatic and probably mildly bactericidal.

#### THE EFFECT OF REFRIGERATION ON MALIGNANCY

The transmission of malignancy by inoculation from one human to another has not, to the author's knowledge, been conclusively proved. The effect of cold upon the transmissibility of human malignancies could not, therefore, be evaluated in the light of clinical experience.

For this reason we have turned to the noteworthy results of the experimental surgeons. Breedis, Barnes, and Furth (29) have demonstrated the viability of mouse sarcoma frozen at  $-30^{\circ}$  to  $70^{\circ}$  C., for 56 days. Their findings indicated that the transmission of leukemia and tumors in frozen tissue is due to the survival of neoplastic cells. Mider and Morton (30) using strains of sarcoma and carcinoma found that after freezing rapidly at  $-74^{\circ}$  C., carcinoma transplants gave 45 to 50 percent successful results and the sarcoma gave 85 to 90 percent successful results. Klinke (31) observed that transplantable sarcoma and carcinoma would grow after freezing to  $-250^{\circ}$  C. Greene (32) believes that the transfer of bone or any other tissue from a cancer

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patient to a normal person carries with it the danger of transferring malignant cells (even if the selected bone is apparently well away from the primary malignancy) and that some malignant osteogenic tumors kept at  $-25^{\circ}\text{C}$ ., will survive and grow when transplanted to animals. Since many patients who have a malignancy may have segments of normal-appearing bone removed during the course of definitive or palliative surgical procedures, the previous admonition is timely. Coley and Higinbotham (33) have used normal-appearing ribs removed during thoracotomies for mediastinal tumors (the majority of which were malignancies) in 16 cases with no unsatisfactory results in short-term follow-ups.

### THE MERTHIOLATE BONE BANK

This method for the chemical preservation of homogenous bone was developed by Reynolds and Oliver (34). It is similar to the method used for the successful preservation of cartilage. The bone is removed aseptically at operation or autopsy; all soft tissue is removed, the marrow cultured, and the bone transplant is then placed in an aqueous solution of 1:1000 merthiolate for 2 weeks. The bone is then removed from the antiseptic solution, recleaned and recultured under aseptic conditions. This step is necessary, for the mode of action of the antiseptic is protein coagulation and considerable glutinous debris accumulates. The bone is then placed in a 1:5000 solution of merthiolate which is changed monthly or biweekly for the purposes of cleanliness. After two negative cultures, the graft may be used. Reynolds and Oliver (8) found that grafts preserved in merthiolate solutions were morphologically similar to autogenous grafts preserved under similar conditions and in some respects were better than frozen grafts. In 71 cases in which the merthiolate grafts were used, 42 were reported successful. The advantages of this method lie in its ready availability, its inexpensive material, and its simple space requirements. It is also being used in those cases in which infection may recur (35).

The writer believes the following considerations are to be noted: (a) Transferring the bone from a 1:1000 solution to a 1:5000 solution of merthiolate can be compared to transfer from a distinctly bactericidal solution to a much less bactericidal solution. (b) The bone is subsequently removed from the 1:5000 solution biweekly for cleaning purposes and thus exposed to the open environment and, just as in other operative procedures, contamination is possible. (c) Cultures of bone fragments are not considered to be adequate evaluations of the possible contamination of the deeper portions of any bone. The antiseptic action of the mercurial is dependent upon its ability to coagulate protein. This results in a surface film of protein coagulum

which permits minimal surface penetrations and is easily washed off. The antiseptic value of this bone is questionable when it is placed in the host for the protective and antiseptic-impregnated surface film is usually washed off as a preliminary to surgical installation.

The value of such mercurials apparently is in their preservative actions and their slight to moderate bactericidal value for the protein coagulum is not only bactericidal but may act as a seal preventing excessive tissue dehydration.

### THE SURGICAL USE OF PRESERVED BONE GRAFTS

Frozen bone is most commonly applied in the form of chips, slivers, and crumbs. These are of value in such procedures as fusions for scoliosis, severe instability of the lumbosacral articulations, and spondylolistheses. In addition, the implantation of cancellous and cortico-medullary crumbs as an adjunct to fracture treatment by internal metal fixation is a growing practice. This is in keeping with published reports of satisfactory chip-graft results in the experimental animal as well as in man. To date, no experimental evaluation of large preserved homogenous grafts has been reported. Accordingly the use of this type of cortical grafts has not enjoyed the popularity of the smaller cancellous graft. Weaver (7) has used corticomedullary preserved bone grafts with equivocal results in some cases. One fundamental to be learned from the preceding is that frozen grafts should not be expected to perform well physiologically when fresh grafts have previously failed under similar circumstances.

### DISCUSSION

The disadvantages of preserved homogenous bone grafts are: (a) Preserved grafts are not satisfactorily revascularized nor as much of a host stimulus as are the autogenous counterparts. (b) Some orthopedic surgeons fear that these preserved graft substitutes will not be adequately revascularized and that, if revascularized, the grafts may not be as acceptable to the host and will "melt away" as does human homogenous skin grafts. (c) Other groups believe that not only is it undesirable to take bone from the same patient but also that the free and easy access of bone replacement may prompt unnecessary surgery. (d) Some surgeons consider that the present clinical indications are not inclusive enough to warrant the expense of bone-bank equipment and the assignment of personnel. (e) The shortage of qualified personnel to assume the responsibilities and duties of administration of a bone bank and, in addition, the necessity of training technicians is, at present, a very practical disadvantage. (f) The lack of standardization of indications, methods, and forms

for bone-bank deposits and withdrawals, necessitates considerable loss of time of qualified personnel.

Basically, it is proved that the smaller sections of preserved bone are not only physiologically acceptable but also they are completely albeit slowly revascularized. Since the concept of the bone bank over 5 years ago, there have been no reports indicating graft disappearance or "melting" other than that expected with comparable fresh autogenous graft. The infection rate has not exceeded that expected from any other orthopedic procedure. Wilson (4) reported infections in 2 percent in over 200 consecutive cases in which frozen bone was employed. In our experience, the use of a frozen-bone graft with minimal soft-tissue dissection at the operative site is of noteworthy value. Not only has the average operating time been shortened by at least 30 percent but there is less postoperative pain, and the need for sedatives is proportionately diminished. The convalescence is shortened since there is only one operative site to consider. The chronic pain which often characterizes donor sites is now no problem. Supportive measures, such as blood transfusions, that were previously routine in major bone-grafting procedures, are now the exception rather than the rule.

#### CONCLUSIONS

Frozen bone appears to serve the functions demanded of an osteoplastic transplant and has additional values also, for it acts not only as a "filler" for an osseous defect but it also stimulates active bone formation on the part of the host. It may serve the demands of osteosynthesis and, in addition, stimulate osteogenesis. While frozen homogenous bone is not revascularized as well as its fresh autogenous counterpart and, in the frozen cortical homogenous grafts, the delay may be considerable (7), it will ultimately be identical with the host. These factors limit the clinical indication for preserved bone.

The smaller orthopedic institutions would benefit by watchful waiting until development of the present trends in the use of frozen-bone grafts which is having a major trial in the larger institutions. As results are published, the acceptance or rejection of the use of preserved homogenous bone could then be made to fit the needs.

The future of the use of preserved bone, if scientifically controlled, vigorously pursued, and applied with considered and mature surgical judgment, may prove to be of value to every orthopedic surgeon.

#### REFERENCES

1. LIPSCOMB P. R. and BONFIGLIO R. A. Personal communication
2. KEY J. A. Choice of operation for delayed nonunion of long bones. *Ann Surg* 118: 665-680 Oct 1943

3. BUSH, L. F., and GARBER, C. Z.: The bone bank. *J. A. M. A.* 137: 588-594, June 12, 1948.
4. WILSON, P. D.: Experiences with bone bank. *Ann. Surg.* 126: 932-946, Dec. 1947.
5. WALSH, A. C.: Thesis: I. Use of homogenous and heterogenous bone in bone grafting. II. Method of preserving homogenous bone for use in bone grafting. Mayo Foundation, 1947.
6. LIPSCOMB, P. R.: Exhibit: Alkaline phosphatase in transplantation of frozen bone. (American Academy of Orthopedic Surgery, 1948.) Mayo Clinic permanent exhibit
7. WEAVER, J. B.: Experiences in use of homogenous (bone bank) bone. *J. Bone & Joint Surg.* 31A: 778-792, Oct. 1949.
8. REYNOLDS, F. C., and OLIVER, D. R.: Clinical evaluation of methiolate bone bank; a preliminary report. *J. Bone & Joint Surg.* 31A: 792-799, Oct. 1949.
9. INCLAN, A.: Use of preserved bone graft in orthopaedic surgery. *J. Bone & Joint Surg.* 24: 81-96, Jan. 1942.
10. ZIMBRON, A. V.: Bone Bank (motion picture). Audio-Visual Section, American Academy of Orthopedic Surgery, 1949.
11. OLLIER, L.: *Traite Experimental et Clinique de la Regeneration des os et de la Production Artificielle du tissu osseux.* Vols. 1 and 2. Victor Masson et Fils, Paris, 1861. pp. 412-457.
12. TUFFIER: Cited by CARREL, A. (13).
13. CARREL, A.: Preservation of tissues and its applications in surgery. *J. A. M. A.* 59: 523-527, 1912.
14. ALBER, F. H.: Bone transplantation as a treatment of Pott's disease, club-foot, and ununited fractures. *Papers on orthopedic surgery in the New York Postgraduate Medical School and Hospital, 1912.* pp. 463-485.
15. ALBEE, F. H.: *Bone-Graft Surgery.* W. B. Saunders Co., Philadelphia, Pa., 1916.
16. GROVES, E. W. H.: Methods and results of transplantation of bone in the repair of defects caused by injury or disease. *Brit. J. Surg.* 5: 185-242, Oct. 1917.
17. KETHIL, W. S.: Small bone grafts. *J. Bone & Joint Surg.* 16: 314-330, Apr. 1934.
18. ORELL, S.: Surgical bone grafting with "os purum," "os novum," and "boiled bone." *J. Bone & Joint Surg.* 19: 873-885, Oct. 1937.
19. SMITH, A. DEF.: Use of homologous bone grafts in cases of osteogenesis imperfecta. *Arch. Surg.* 31: 687-694, Apr. 1937.
20. SMITH, A. DEF.: Cited by BUSH, L. F., and GARBER, C. Z. (3).
21. BUSH, L. F.: Use of homogenous bone grafts; preliminary report on bone bank. *J. Bone & Joint Surg.* 29: 620-628, July 1947.
22. HARDY, SIR W. B.: Microscopic study of freezing of gel. *Proc. Roy. Soc., London, s. A.* 112: 47, 1926.
23. MORAN, T.: Freezing of gelatin gel. *Proc. Roy. Soc., London, s. A.* 112: 30-46, 1926.
24. STILES, W.: On the cause of cold death of plants. *Protoplasma* 1930. pp. 459-467.
25. STUMMA, M., MCGRAW, J. J., and REICHEL, J.: Preparation and preservation of human plasma; freezing of plasma and preservation in frozen state. *Am. J. Clin. Path.* 11: 388-401, May 1941.
26. HAYES, R. B.: Effect of freezing on bacteria. *Proc. Roy. Soc., London, s. B.* 124: 451-463, Jan. 14, 1938.
27. FINN, D. B.: Denaturation of protein in muscle juice by freezing. *Proc. Roy. Soc.* 111: 396-411, Sept. 1932.



28. TURNER, T. B. : Preservation of virulent *Treponema pallidum* and *Treponema pertenue* in frozen state, with note on preservation of filtrable viruses. *J. Exper. Med.* 67: 61-78, Jan. 1938.
29. BRFEDIS, C. ; BARNES, W. A. ; and FURTH, J. : Effect of rate of freezing on transmitting agent of neoplasms of mice. *Proc. Soc. Exper. Biol. & Med.* 36: 220-224, Mar. 1937.
30. MIDER, G. B., and MORTON, J. J. : Effect of freezing in vitro on some transplantable mammalian tumors and on normal rat skin. *Am. J. Cancer* 35: 502-509, Apr. 1939.
31. KLINKF, J. : Direct proof that cancer and normal cells live after freezing at temperatures down to  $-263^{\circ}\text{C}$ . *Growth* 3: 169-172, July 1939.
32. GREENE, H. S. N. : Personal communication to G. E. Haggart, Chief of Bone and Joint Surgery, The Lahey Clinic.
33. COLEY, B. L., and HIGGINBOTHAM : Use of bank bone in the treatment of central lesions of bone. *Papers of the American Association for the Surgery of Trauma*, Yorke Publishing Co., Inc., 1949.
34. REYNOLDS, F. C., and OLIVER, D. R. : Exhibit. Methylolite bone bank. (American Academy of Orthopedic Surgery, 1949.) Washington University, St. Louis, Mo.
35. OLIVER, D. R. : Personal communication.



# Osteitis Fibrosa Cystica of the Rib

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PRIMARY tumors of the ribs are rare in contrast to metastatic lesions. All types of primary osseous and cartilaginous growths which affect other bones may be found in the ribs. Harper (1) reviewed the literature on primary, benign tumors of the ribs and found only 87 cases; these included 60 chondromas, 11 giant cell tumors, 9 fibromas, and 7 osteomas. He added one case of chondroma and one case of myxomatous degeneration of a chondroma or latent bone cyst that he considered a form of osteitis fibrosa cystica. Schlumberger (2) recently reported 67 patients with fibrous dysplasia involving a single bone, 29 of whom had a lesion in a rib.

The diagnosis of a solitary tumor of the rib is often difficult. The history of the patient varies; the patient may complain of pain or may be asymptomatic. Physical examination may be unrevealing as the tumor may not be palpable. A careful search for a primary tumor should be made in all parts of the body. Often, the tumor is discovered when a roentgenogram of the thorax is made. Whenever a tumor of a rib is found it should be considered malignant until proved otherwise. The following examinations should be made: a careful study of the formed elements of the blood; the value of the serum proteins, serum calcium, blood phosphorus, and plasma alkaline phosphatase should be determined; a serologic test for syphilis should be made; and the urine should be tested for Bence-Jones protein. A roentgenologic survey of the skull, vertebrae, pelvis, and long bones to find other tumors is extremely valuable in making a diagnosis. If the results of these examinations are negative, a resection of the rib extending beyond the neoplasm should be performed.

We have studied three patients with isolated rib lesions. In each patient, a diagnosis of osteitis fibrosa cystica or fibrous dysplasia was made.

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## CASE REPORTS

*Case 1*—The patient, a 19-year-old Negro, was returned from overseas because of a psychoneurosis. He did not have any symptoms referable to his chest, and no tumor was palpated in the thoracic wall. A routine roentgenogram of the thorax (fig 1A) disclosed normal lung fields and a tumor measuring 5 by 2.5 cm in the right sixth rib in the posterior axillary line. The cortex of the rib was greatly expanded. The central portion of the tumor was radiolucent with numerous, small trabeculations dividing the space into compartments. A roentgenographic skeletal survey was made but no other lesions were found. The laboratory findings were normal.

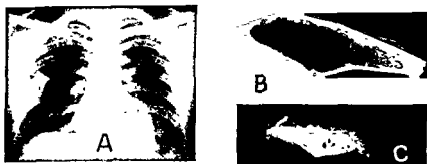


Figure 1—Case 1. (A) Roentgenogram of the thorax showing cystic lesion in right sixth rib. (B) Roentgenogram of the specimen. (C) Longitudinal section of the specimen.

Thoracotomy, with resection of about 10 cm of the right sixth rib, including areas beyond the tumor, was performed. The affected rib was exposed in the posterior axillary line and the bone, the adjacent intercostal bundles, and the underlying pleura were explored.

The postoperative course was complicated by subcutaneous emphysema and a small amount of atelectasis in the middle lobe of the right lung and the lower lobe of the left lung. After coughing and expectoration of tenacious sputum, aeration became complete. The wound healed uneventfully.

On gross pathologic examination, the resected portion of the rib was found to be about 10 cm long. It presented an expansive central portion with a spindle deformity of the rib to about three times the normal diameter (fig 1C). On section the bone was soft, the cortex thin, and at the greatest diameter looked as though the rib was fractured and partially healed. The central portion of the tumor was occupied by a soft gray mass, and arranged in convolutions about more vascular cores. The tumor was in the expanded central area of the rib and the resection extended beyond the tumor. A roentgenogram of the specimen is shown in figure 1B. Microscopic examination of the tumor revealed an intense loose fibrosis of the medullary spaces with active osteoplasia and no evidence of new bone formation. Foci of osteoplastic giant cells were seen, and in these areas the tissue was slightly more compact and contained numerous polymorphonuclear neutrophils. No evidence of carcinoma was found.

*Case 2*—The patient was a 37-year-old white soldier who was transferred to a general hospital with a diagnosis of mild myocarditis. The patient had suffered

a compressive injury of the thorax 10 years previously and had received treatment for a fracture of a rib at that time

No tumor was palpated in the thoracic wall. No cardiac disease was found. The laboratory findings were normal. A roentgenogram of the thorax (fig. 2A) revealed normal lung fields and a large cystic area in the left seventh rib near the posterior axillary line. No destruction of the cortex was seen, but the upper corner of the cortex seemed to be broken, apparently from pressure. A roentgenographic skeletal survey did not reveal any other tumors.

Thoracotomy with resection of about 20 cm. of the left seventh rib was performed. The rib, adjacent intercostal bundles, and the underlying pleura were removed in one mass. The postoperative course of the patient was complicated by an attack of bronchitis that responded to penicillin. The wound healed uneventfully

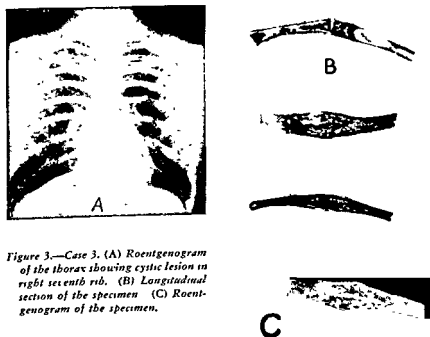
The specimen consisted of a segment of rib about 20 cm. long, the center of which was occupied by a spindle-shaped, symmetrically expanding mass (fig. 2B). The cortex of the bone seemed to be normal in thickness. The medullary cavity was occupied by a soft, gray-pink mass containing numerous spicules of bone. The gross configuration of the tumor was not remarkable. The tumor filled the expanded portion of bone evenly and extended into the shaft of the bone in both directions. A roentgenogram of the specimen is shown in figure 2C. Microscopic examination revealed the marrow cavity to be completely filled with intermingling sheaths of fibroblastic cells having a large number of conglutinate processes. There was some evidence of osteolysis and more evidence of the formation of new bone along preexisting trabeculae. Mitoses were not seen. The cortex of the rib was not infiltrated or perforated



Figure 2.—Case 2. (A) Roentgenogram of the thorax showing cystic lesion in left seventh rib. (B) Longitudinal section of the specimen. (C) Roentgenogram of the specimen.

**Case 3.**—The patient, a 23-year-old Negro, was returned from overseas because of pain of increasing severity in the anterior portion of the right side of the chest over the costal margin. The pain which was present during rest was aggravated by exercise. A slight, nonproductive cough had been present for about 4 months. The patient had suffered a compressive injury to his chest in an automobile accident about 3 years previously.

Physical examination was essentially normal except for moderate tenderness over the right seventh rib in the anterior axillary line. No tumor was palpated



*Figure 3.—Case 3. (A) Roentgenogram of the thorax showing cystic lesion in right seventh rib. (B) Longitudinal section of the specimen. (C) Roentgenogram of the specimen.*

in the thoracic wall. The laboratory findings were normal. A roentgenogram of the chest revealed normal lung fields and an area of cystic expansion in the right seventh rib in the anterior axillary line (fig. 3A). The cortex of the bone around the tumor was thin and numerous, small, fine trabeculations of bone were present within the expanded area. The process seemed rather sharply demarcated and involved a segment of bone about 5 cm. long. No break in the cortex was seen and no soft tissue mass was present. A roentgenologic skeletal survey did not disclose any other tumors.

Thoracotomy with resection of about 12 cm. of the right seventh rib, including an area extending beyond the tumor, the adjacent intercostal muscle bundles, and the underlying pleura was performed. The postoperative course was complicated by a moderate pneumothorax, but reexpansion of the underlying lung was rapid and complete. A slight atelectasis was seen in the lower lobe of the left lung but this cleared rapidly. The wound healed uneventfully.

The resected portion of rib was about 12 cm. long (fig. 3B). Near one end and opposite the cartilaginous insertion was a cystic cavity with smooth walls that contained a small amount of clear, yellow fluid. The marrow was fibrous for a distance of about 8 cm. but was otherwise normal. Roentgenograms of the specimen are shown in figure 3C. Microscopic examination revealed a loose mat of stellate cells having long processes and separated by a loose, fine, fibrous substance that completely replaced the marrow. Moderate osteolysis and osteoclasts were present. The cortex was thin and the periosteum had an appearance not unlike that of the tumor, but was more compact. No mitoses were found. In the central portion of the mass was a cystic space lined by a thin, flat, single layer of fibroblasts. The surrounding area was composed of compressed tumor stroma in which there were areas of recent hemorrhage. A section taken through

the osteochondral junction showed the medullary lesion to be sharply demarcated from the normal marrow, but the tumor seemed to be present under the periosteum at this point, and extended to the area of cartilage.

### DISCUSSION

The three lesions that have been described have no connection with those encountered in the generalized type of osteitis fibrosa cystica caused by adenoma or hyperfunction of the parathyroid glands. The term osteitis fibrosa has been loosely used to refer to all types of bone cyst. With a better understanding of the underlying pathologic changes it has been possible to isolate the particular type of lesion under discussion from the heterogeneous group loosely referred to as osteitis fibrosa cystica. The prime factor in the production of these lesions appears to be trauma. A history of compressive injury to the thorax was obtained in cases 2 and 3.

A consideration of these three lesions reveals that the fundamental changes are those observed in the ordinary repair of bone with a slightly different phase being seen in each case. Geschickter and Copeland (3) (4) (5) have presented the main phases of the problem in their articles on osteitis fibrosa and giant cell tumor. They consider trauma a primary cause of those lesions that arise at a point just beneath injured cortex. The trauma impedes the supply of blood coming from the cortex and produces a subperiosteal hematoma. This factor creates a need for collateral circulation by the medullary cavity to open up new channels in bone for the budding capillaries. The same authors state that this increased osteoclastic activity, in an area where the osteoclasts are already unusually active in the role of new bone construction occurs just at the time when the undernourished cortical bone is undergoing necrosis. Thus an imbalance between bone destruction by osteoclasts and the formation of new bone that would normally proceed from the active cortex is present. Where the defensive reaction of the bone is poor as in the epiphysis, an unchecked hyperplasia of the giant cells occurs and tissue characteristic of a giant cell tumor results. In the metaphysis where the reactive cortical bone is thick and vascular and the tissue reaction can overtake the osteoclasts, an arrested lesion may result which exhibits the various stages of osteitis fibrosa, with and without the formation of cysts. The giant cell tumor of the epiphysis is a lesion in which the healing tendency is not present while the osteitis fibrosa represents an advanced healing stage of bone following trauma. Geschickter and Copeland (5) state that a similar reaction may occur in the small or flat bones with the production of a spindle cell variant of a giant cell tumor. Spatial limitations bring the tumor almost immediately into relation with cortical bone on all sides and an early defensive reaction that exhibits itself microscopically as a fibrous proliferation, resulting in a

so-called spindle cell variant of a giant cell tumor, occurs. The tendency toward repair, however, although invoked early, is not so distinct as in the shaft of the long bone where the cortex is thicker and more active. A partial healing process is present.

In *osteitis fibrosa*, the ordinary bone marrow is replaced by fibrous tissue containing ovoid and spindle cells and, in some cases, many blood vessels. This vascular connective tissue may assume the appearance of ordinary fibrous tissue or have a whorled arrangement. Numerous scattered foci of new bone may be present. Areas of giant cells are found when the proliferative processes are most active. Evidence of hemorrhage may be seen. These findings are those of a healing reaction in bone. Geschickter et al. (3) write that varied microscopic appearances, depending on the type of bone affected, the specific site of a long bone involved, and the age of the patient, will be seen.

The roentgenogram of *osteitis fibrosa* reveals an expansile lesion of the bone marrow with extreme thinning of an intact cortex. The central portion of the tumor is radiolucent with numerous small trabeculae dividing the marrow into compartments.

Having performed the various diagnostic tests enumerated, a differential diagnosis should be attempted. It is assumed that only a single lesion in a rib has been found after a thorough roentgenologic survey. The roentgenologic study will eliminate polyostotic fibrous dysplasia and hyperparathyroidism. A decision may be difficult as to whether a giant cell tumor, a spindle cell variant of the giant cell tumor, or *osteitis fibrosa* is present, when the diagnosis is limited to these three lesions. The diagnosis can be made only by microscopic study of the tumor, and then if different areas of the same lesion are studied, it may be realized that all of these three conditions, which are different phases of one fundamental process, are being seen.

Statistically, giant cell tumors of the ribs are uncommon. Samson and Haight (6) collected only nine cases and added one of their own. It is also difficult to find reports of *osteitis fibrosa* of ribs since this, too, is an uncommon lesion. This is to be expected since probably the same factor is effective in producing both lesions. An isolated pyogenic abscess of a rib is also an uncommon lesion. Physical examination revealing tenderness over a localized segment of rib, an elevated leukocyte count, with an increased number of polymorphonuclear neutrophils in the peripheral blood stream, and the roentgenogram will indicate the diagnosis.

A gumma may simulate a bone cyst. A positive serologic test for syphilis should make the surgeon suspicious that a syphilitic bone lesion is present. The roentgenogram may reveal a perforation of the expanded cortex, periosteal involvement, and sequestration. Osteo-

mas, osteochondromas, and chondromyxomas may be differentiated by roentgen examination. In many of these cases, however, great difficulty in making an exact diagnosis may be encountered. Eosinophilic granuloma occurs more often in the ribs and skull, although other bones may be affected. Eighty percent of the lesions occur in children. The disease is rarely seen after the age of 25 years. All symptoms are caused by the local lesion but symptoms may be absent. The number and the morphology of the leukocytes are usually normal, although a slight eosinophilia may be present. Values for calcium, phosphorus, and acid and alkaline phosphatase in the serum are normal. On the roentgenogram, a rarefied area with erosion of the cortex and perhaps fracture may be seen. The diagnosis is difficult and removal of a specimen for biopsy or, in the case of a rib, excision may be indicated to obtain material for microscopic study.

A multiple myeloma will usually reveal itself by increased total blood protein values, the presence of Bence-Jones protein in the urine in some, not but all cases, and multiple areas of bone destruction. Instances of myeloma affecting only one bone have been reported but eventually the true nature of the disease will be recognized. A single destructive lesion in a rib may represent a metastatic deposit from a carcinoma elsewhere in the body and a careful roentgenographic survey that includes examination of the pulmonary, gastrointestinal, and genito-urinary tracts, may disclose the primary lesion. In some cases it may be impossible to find the primary lesion on the initial examination. Removal of the affected rib and microscopic examination may reveal a malignancy, although its source may remain unknown for a long time.

Tumors of the intercostal nerves may simulate neoplasms of the ribs both clinically and roentgenologically. Intrathoracic tumors of nerve or tumors of the posterior mediastinum may occasionally be mistaken for neoplasms of the ribs.

Having arrived at a tentative diagnosis the surgeon is confronted with a problem of therapy. If the diagnosis can be definitely established as osteitis fibrosa, there is no need for operation. Mallory (7) states: "There is no record of a case of fibrous dysplasia that was followed by osteogenic sarcoma or other form of malignant tumor, so that there is no probability of harm to the patient if it is left untreated." Since, however, an absolute diagnosis can rarely be made, removal of the affected rib is usually indicated.

#### SUMMARY

Lesions of osteitis fibrosa cystica of a rib are usually discovered on routine roentgenographic examination of the thorax. A history of trauma to the thorax is obtainable in many instances. The values for



serum calcium, phosphorus, and blood alkaline phosphatase are within normal limits. It is difficult to differentiate the variants of fibrous dysplasia preoperatively. When possible, these lesions should be removed because of the difficulty in making a definite diagnosis. The operative risk is slight.

#### REFERENCES

1. HATFER, F. R : Benign chondromas of ribs. *J Thoracic Surg* 9: 132-144, Dec. 1939
2. SCHLUMBERGER, H. G : Fibrous dysplasia of single bones (monostotic fibrous dysplasia). *MIL. Surgeon* 99: 504-527, Nov. 1946.
3. GOSCHICKTER, C. F.; COPELAND, M. M.; and BLOOMGARDEN, J. C : Osteitis fibrosa and giant cell tumor. *Arch. Surg* 19: 163-271, Apr. 1929.
4. GOSCHICKTER, C. F., and COPELAND, M. M : Tumors of giant cell group; pathologic entity. *Arch. Surg* 21: 147-156, July 1930.
5. GOSCHICKTER, C. F., and COPELAND, M. M : Tumors of Bone. Revised edition. *The American Journal of Cancer*, New York, N. Y., 1936.
6. SAMSON, P. C., and HAIGHT, C. : Giant cell tumor of costal origin. *J. A. M. A.* 105: 1020-1023, Sept. 28, 1935.
7. MALLORY, T. B (discussant). Case number 32452 (Case Records of the Massachusetts General Hospital section) *New England J. Med.* 235: 603-604, Nov. 7, 1946.



# An Epidemic of Vomiting and Diarrhea

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**D**URING the fall and winter of 1948 epidemics of acute gastro-enteritis occurred in the San Antonio area. The disease was characterized by sudden onset of nausea, vomiting, and diarrhea, and was usually accompanied by a low fever. Respiratory symptoms were usually absent. In most patients the course was brief and the symptoms subsided within 24 to 72 hours. In a few patients the fever and symptoms persisted for a week. No sequelae were observed. Since the disease was comparatively mild and of short duration, only a few of the patients consulted a physician and accurate figures on the incidence were not obtained. In this same period the State Health Department of Texas reported a high rate of dysentery. Their cases were probably related to ours since the majority were not confirmed by laboratory findings. Investigation showed that if one member of a family contracted the disease, the other members usually acquired it within the next 3 days. This would suggest a short incubation period, but the syndrome was so widespread and contacts so numerous that no definite conclusions could be drawn.

The syndrome has been variously called "intestinal flu," "virus vomiting and diarrhea," "epidemic diarrhea," "nausea and vomiting," "stomach flu," and "seasonal gastro-enteritis." Because of the wide distribution, the relatively mild character of the symptoms, and the prompt recovery without sequelae, it should be sharply differentiated from so-called "infant diarrhea," the effects of which are often pernicious and prolonged. Clinically, this outbreak corresponded closely to the epidemic of anorexia, malaise, diarrhea, nausea, and vomiting that occurred in October and November of 1943 and 1944 in two boarding schools in Philadelphia (1). A series of similar outbreaks occurred in New York City in the fall and winter of 1946-47 (2). We have analyzed a series of 13 cases.

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## SYMPTOMS

*Vomiting, nausea, and anorexia.*—Twelve of the thirteen patients exhibited one or more of these symptoms, and it is estimated that about the same proportion holds for the whole group. The onset of vomiting was sudden, was frequently severe and continued for from 8 to 10 hours. The vomitus usually was clear and watery and contained no blood.

*Abdominal cramps and diarrhea.*—Five of our patients did not exhibit either of these symptoms, and we estimate that this same proportion held for the whole group. When diarrhea occurred, it usually followed the vomiting. The stools were watery, profuse, yellow, and contained no blood or mucus. The responsible agent showed a pronounced tropism for the gastrointestinal tract. The liver and spleen were not enlarged in the patients examined.

*Malaise, chills, and weakness.*—These symptoms appeared in 11 of the 13 patients. Many also complained of muscular aches, usually in the legs and back during the acute episode. These symptoms prompted the diagnosis of "intestinal flu." A few patients complained of generalized stiffness and soreness associated with general and orbital headaches.

*Respiratory symptoms.*—These occurred in only 4 of the 13 patients and, when present, varied from a slight serous nasal discharge to a moderately sore throat.

*Temperature.*—Since few of the patients were hospitalized, temperature charts were not available. Temperatures in those patients whose temperatures were taken were between 99° to 103° F. The fever rarely lasted longer than 24 hours.

## LABORATORY FINDINGS

Four patients had a leukocytosis. The percent of polymorphonuclear cells was normal or slightly increased. All of these counts were performed in the first few hours of the disease.

All throat cultures were negative for pathogens. Agglutination-inhibition tests for influenza types A, A', and B, performed on sera drawn in the acute phase, and 7 to 10 days later, uniformly failed to give a diagnostic rise in titer for any of the strains. Lennette states that in California in 1948 he found proved cases of influenza type A and, simultaneously, cases of vomiting and diarrhea that were negative for known serologic types of influenza (3). Agglutinations for *Salmonella schottmulleri*, *Salmonella paratyphi*, and *Brucella abortus* were negative.

One patient gave a cold agglutinin titer of 1:128 on the first day of the disease but his convalescent serum was negative. In view of the

fact that he had a respiratory infection a week previously, and that cold agglutinins usually do not appear until five or more days after the onset of primary atypical pneumonia, these agglutinins probably were unrelated to the acute gastrointestinal episode. None of the other patients had significant cold agglutinin titers.

Unfortunately stool specimens were not obtained in a significantly large number of cases. Because of the widespread occurrence of the disease it was not considered to be of bacterial (*Salmonella* or *Shigella*) origin. Bacteriologic studies for enteric pathogens in the cases studied by Reimann and coworkers (1) and Gordon et al. (2) were negative.

*Age.*—The ages of our patients (in contrast to diarrhea of the newborn) ranged from 9 to 60 years; but a few cases were reported in younger children and infants. No definite variation in severity was observed in different age groups, but frequently there was variation in severity among the members of a family.

#### TRANSMISSION EXPERIMENTS

Reimann, Price, and Hodges (4) attempted unsuccessfully to isolate a filtrable agent from adults with nausea, vomiting, and diarrhea in the Philadelphia epidemic. Stool supernates were inoculated orally, intranasally, and rectally; pharyngeal washings in bouillon were inoculated intranasally; and Berkefeld (normal) filtrates (both pharyngeal washings and stools) were inoculated intracerebrally in young mice. The results were not significant. These investigators then used the technique of Light and Hodes (5) (who had reported isolation of a filtrable agent causing diarrhea in newborn calves from patients with epidemic diarrhea of the newborn), but were unable to duplicate their results. Reimann concluded that perhaps (*a*) the virus had disappeared during preservation of the frozen stools, (*b*) the virus was never present in the stools, (*c*) insufficient amounts of inoculum were used, or (*d*) the disease with which he dealt in the adults was different than that in the newborn.

Later, Reimann, Price, and Hodges (6) experimented on human volunteers. Among 32 volunteers who inhaled nebulized filtered garglings, symptoms developed in 17. Of the 21 who inhaled nebulized stool filtrates, 11 developed symptoms. No attacks occurred in 6 volunteers who were fed serum nor in 24 volunteers who were fed serum or filtrates of garglings or stools. The conditions of the experiment were not ideal since isolation of the volunteers was not possible. Furthermore, a declining natural epidemic was present in the population used at the time the experiments were performed. Of the combined groups of 53 volunteers, 28 (53 percent) developed symp-

toms as compared with 22 out of 240 (9 percent) of the remainder of the group studied in which the natural disease apparently occurred during the period of the tests. Reimann and his associates believe that the difference is significant and that the tests suggest that the causative agent of the disease is filtrable, air-borne, enters through the respiratory tract, and is present in the oropharynx, but not in the blood.

Gordon, Ingraham, and Korn (2) likewise obtained negative results in experimental animals and successful transmission in human volunteers, but their experience was the reverse of that of Reimann. They were able to transmit the disease without difficulty using stool filtrates administered orally, and were able to transmit the disease by feeding filtered throat washings, but they were unable to duplicate the experiments using nebulized throat sprays of throat washings. Their experiments were well controlled. The incubation period of the experimentally induced disease ranged from 1 to 5 days, compared with 1 to 21 days in Reimann's experiments. Gordon concluded that different etiologic agents were responsible for the disease studied by Reimann, and stated that variations in the epidemiologic and clinical pattern of outbreaks investigated by the State Health Department of New York suggest that gastro-enteritis may be caused by more than one unrecognized agent. This may explain the discrepancies between the respective results, but technical and control factors may be responsible.

Throat washings obtained early in the course of the disease in the San Antonio patients were filtered and administered orally and intranasally to mice with negative results. Filtered throat washings had no effect on embryonated hen's eggs when administered by the yolk sac, amniotic, and allantoic routes. One monkey, fed filtered, bacterially sterile throat washings, developed a transient diarrhea without fever on the second day of inoculation, but the results could not be repeated, nor could the monkey material be passed serially, so that the results were inconclusive. Corneal inoculations of rabbits with throat washings by the technique of Buddingh and Dodd (7) were negative.

Through the cooperation of the Department of Preventive Medicine of the University of Texas we attempted transmission experiments in a small series of human volunteers. Five young men were examined thoroughly and found physically normal. None had had a respiratory or gastrointestinal disease within the previous 6 months. After a period of isolation of 3 days, four of these volunteers gargled and then swallowed 5 ml. each of pooled filtered throat washings from two of our patients. The other volunteer was given no inoculum, but stayed in the isolation room with the others. All five were followed

closely for 2 weeks. None showed any symptoms of respiratory or gastrointestinal disease, and their leukocyte counts and temperatures remained normal.

### SUMMARY

A widespread epidemic of gastro-enteritis in the San Antonio area was characterized chiefly by sudden onset of nausea and vomiting, often with diarrhea. The disease was self-limited, without sequelae, and recovery usually ensued within 72 hours. Laboratory studies have not revealed the etiologic agent. Attempts to transmit the disease to human volunteers by pharyngeal and oral administration of filtered throat washings were unsuccessful. Because of the close clinical similarity between the patients in this epidemic and others in whom a filterable agent has been shown to be responsible, the syndrome we have described is probably of viral origin.

### REFERENCES

1. REIMANN, H. A.; HODGES, J. H.; and PRICE, A. H.: Epidemic diarrhea, nausea and vomiting of unknown cause. *J. A. M. A.* 127: 1-6, Jan. 6, 1945.
2. GORDON, I. (Albany, N. Y.); INGRAHAM, H. S.; and KOENS, R. F.: Transmission of epidemic gastroenteritis to human volunteers by oral administration of fecal filtrates. *J. Exper. Med.* 86: 409-422, Nov. 1947.
3. LENNETTE, E. H.: Personal communication.
4. REIMANN, H. A.; PRICE, A. H.; and HODGES, J. H.: Negative results in studies of epidemic diarrhea, nausea and vomiting of unknown cause. *Proc. Soc. Exper. Biol. & Med.* 55: 233-234, April 1944.
5. LIGHT, J. S., and HODGES, H. L.: Studies on epidemic diarrhea of new-born; isolation of filterable agent causing diarrhea in calves. *Am. J. Pub. Health.* 33: 1451-1454, Dec. 1943.
6. REIMANN, H. A.; PRICE, A. H.; and HODGES, J. H.: Cause of epidemic diarrhea, nausea and vomiting (viral dysentery). *Proc. Soc. Exper. Biol. & Med.* 59: 8-9, May 1945.
7. BUDDINGH, G. J., and DODD, K.: Stomatitis and diarrhea of infants caused by hitherto unrecognized virus. *J. Pediat.* 25: 105-113, Aug. 1944.



# Cryptococcus Neoformans Meningo-encephalitis

## Report of a Fatal Case

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**S**YSTEMIC fungus disease is not common and consequently is often overlooked, especially in its earliest stages. Furthermore, the isolation of the suspected organism may prove difficult in life and may not be achieved prior to necropsy.

Among the rarest of pathogenic fungi that may lead to fatal infection is *Cryptococcus neoformans*. Up to the present time about 100 cases of cryptococcosis have been reported. This fungus has a particular affinity for the central nervous system. Von Hanseemann (1) in 1905, was the first to record the lesions of cryptococcosis or totulosis, but it remained for Stoddard and Cutler (2) in 1916, first to describe adequately the clinical and pathologic findings. They differentiated infection due to coccidioides, yeast, and *Candida* organisms. Freeman (3) presented an excellent histologic study in 1931. A comprehensive review of the clinical features of all cases up to 1937 was reported by Levin (4). Reeres et al. (5) included the 73 reported cases up to 1941 and added 6 of their own.

A case in which the diagnosis was not definitely established until necropsy is reported.

### CASE REPORT

P I C, a 42-year-old white man was admitted to the United States Naval Hospital, Bethesda, Md., on 15 October 1948, complaining of recent weight loss, general malaise, headache, nausea, and emesis which began 1 week prior to admission.

He appeared ill and poorly nourished. His initial temperature, pulse, and respiration were normal. The physical examination disclosed only a slight stiffness of the neck and increased muscle tone in the abdomen. The laboratory work, which consisted of a complete blood count, urinalysis, sedimentation rate,

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and serologic studies, showed no abnormality. Five days after admission, he showed personality changes; he was withdrawn and negativistic.

On 5 November, a lumbar puncture was performed, and the cerebrospinal fluid showed xanthochromia, 32 lymphocytes and 95 red cells per cu. mm., a protein level of 1,100 mg. per 100 cc., a decrease in the spinal fluid sugar, and a normal chloride level. The spinal fluid Kahn test and colloidal gold curve were negative. The electro-encephalogram showed a generalized abnormal tracing. A diagnosis of subdural hematoma was considered, and following a neurosurgical consultation, bilateral trephine holes were made on 10 November. No subdural hematoma was found. His recovery following the operation was uneventful.

On 10 December the cerebrospinal fluid revealed xanthochromia, a continued elevated protein, and 29 lymphocytes per cu. mm. No further spinal fluid studies were performed because of the small amount of fluid obtained. The patient received symptomatic care until the middle of January, when he became incontinent of feces and urine. Despite preventive treatment he had decubitus ulcers. Weakness and frequent involuntary movements of the lower extremities occurred, followed later by progressive paralysis of all his extremities. The patient was disoriented, uncooperative, and had frequent hallucinations. His temperature then showed slight elevation.

The clinical impression of meningo-encephalitis of fungal or tuberculous origin could not be substantiated. Further attempts to obtain cerebrospinal fluid were unsuccessful. All previous cultures of spinal fluid had been negative for bacteria and fungi. Throughout his illness the patient showed only transient elevations of temperature, reaching 103° F. on occasion. Starting in November, he was given 100,000 units of penicillin and, except for a few days' interruption, treatment was continued until the latter days of his illness. He received a total of 65 million units of penicillin but his condition did not improve and he died on 6 April 1949, 6 months after the appearance of initial symptoms.

#### *Autopsy*

*Gross examination.*—There were numerous decubitus ulcerations over pressure areas. The skin of the lower extremities was atrophic and edematous. The lungs showed mild congestion. Moderate fatty metamorphosis of the liver was present. In addition there was cystitis and moderate bilateral pyelonephritis.

The brain was normal in size and shape. The leptomeninges appeared cloudy and dull. The convolutions were slightly flattened. There was almost total absence of spinal fluid. The lumbar segment was notably enlarged and softened. The cauda equina was bound in an abundant, gelatinous, grayish exudate. The remainder of the cord, except for dull meninges, appeared normal.

Examination, after formalin fixation, showed that the choroid plexuses of the lateral ventricles were bound with a bulky, grayish, gelatinous, translucent exudate. The remainder of the ependymal lining did not appear involved. The brain substance, including the cerebellum, appeared normal. No cystic lesions were noted in either the meninges or the brain substance. Smears of the exudate in the region of the cauda equina revealed numerous, small, round to oval, single budding organisms.

*Microscopic examination.*—The meninges and the choroid plexus particularly showed extensive distortion of architecture. The entire structure contained numerous small cystlike areas containing groups of encapsulated organisms lying within giant macrophages (figs. 1, 2, and 3). The organisms were round





Figure 1.—Sections of the choroid plexus. Note the cystic lesion containing numerous organisms.



Figure 2.—Sections of the choroid plexus. Note the lack of cellular response to the organisms.

to oval,  $3\mu$  to  $20\mu$  in diameter, with a thick transparent capsule. The cell body stained lavender with hematoxylin and a brilliant red with periodic acid. Occasional single budding forms were present. Usually several organisms were lying free in the stroma, which was composed of a vascular fibrous tissue containing moderate numbers of lymphocytes and a few monocytes and plasma cells. In general, there was a mild cellular response to the organisms. The adjacent brain tissue showed mild inflammatory changes in the vessels. Representative sections through the cerebral cortex showed slight fibrous thickening of the meninges and a mild infiltrate of lymphocytes and plasma cells. These changes were most pronounced in the sulci. Only an occasional *C. neoformans* was noted here while the subjacent brain failed to show any. There was mild degeneration of the neurons with some satellitosis.

Spinal cord changes were most noticeable in the lumbar region and about the cauda equina. The leptomeninges were no longer recognizable. The nerve trunks of the cauda were completely ensnared in a dense exudate in which scattered organisms were distinctly outlined by their clear capsular halo. A widespread necrotizing arteritis with edema and cellular infiltration of the wall was present (fig 4). The tissues immediately surrounding these vessels were necrotic. The neurons and nerve trunks were degenerated and the axons and periaxonal spaces were swollen. The surface of the spinal cord showed severe



Figure 3.—Details of structure of the organisms. Note the wide transparent capsule.



Figure 4.—Sections of spinal meninges. Note the necrotizing arteritis.

edema. There were scattered organisms within the wall. The other tissues showed no evidence of cryptococcal invasion.

The original colonies grew out slowly on Sabouraud's maltose agar, forming round to oval grayish yellow mucoid colonies in which no mycelia were noted. The cells were spherical, encapsulated, and measured  $3\mu$  to  $12\mu$  in diameter. Intracerebral inoculations of the culture into mice resulted in death; cystic lesions formed which contained myriads of organisms.

### DISCUSSION

*C. neoformans* (*Torula histolytica*) has a world-wide distribution. It has been reported as occurring most often in the southern region of the United States. Benham (6) found cryptococci widespread in nature and in both animal and vegetable material; and very frequently found nonpathogenic forms on the skin and in the intestinal tract of normal persons.

The cryptococci are round to oval organisms,  $3\mu$  to  $20\mu$  in diameter, with a thick transparent capsule demonstrable in tissues or culture. They fail to produce spores or mycelia, either in tissues or culture, and reproduce by a single bud. On initial culture they grow very slowly and produce yeastlike colonies that vary from white to gray or yellow to dark brown. According to Benham the pathogenic cryptococci commonly appear shiny and mucoid. They thrive well on Sabouraud's glucose or maltose agar and subcultures grow quickly, often becoming visible within several days. They are relatively inert biochemically. Most organisms will ferment glucose to form acid, but will usually not produce gas. Intraperitoneal or intracerebral inoculation of saline suspensions of the organism into mice leads to widespread lesions from which the organism may be isolated. Death of the mice commonly occurs in 3 to 4 weeks.

### Laboratory examination

From the laboratory standpoint, examination of the blood and urine are of little diagnostic value. The greatest aid comes from examination of the spinal fluid which is often xanthochromic and turbid, although it may be clear. The pressure is usually increased but, in our case, due to involvement of the choroid plexus, fluid production was greatly decreased. The cell count usually ranges from 200 to 800 with wide variation in the extremes and is chiefly composed of lymphocytes. The cryptococci may simulate lymphocytes and have been mistaken for them in the counting chamber. The protein is elevated in both the albumin and globulin fractions (a total of over 1,000 mg. in our patient). The sugar is variable but usually low. The colloidal gold curve is usually of the meningitic type.

*Clinical features*

In the majority of the reported cases of this disease, the ages ranged from 40 to 60 years; deaths have been reported in a child of 2 and in adults over 70 years.

The disease is slightly more common in men than in women. The portal of entry is not definitely known. The most common route is believed to be via the lungs, although the organisms may enter through the skin, nasopharynx, or gastrointestinal tract. According to Levin (4) the organisms have been found in the following organs in order of decreasing frequency: central nervous system, lungs (generalized), kidney, spleen, adrenal, abdominal lymph nodes, the peribronchial lymph nodes, tonsils, subcutaneous tissues, and skin. Almost without exception death has followed involvement of the central nervous system.

The diagnosis is often difficult because (a) the disease is uncommon and not always considered in the diagnosis; (b) its manifestations are protean so that other more common conditions (the encephalitides and meningitides of tuberculosis, syphilis, other fungus disease, brain abscess or tumor, degenerative neuropathies, and psychogenic disorders) are considered; and (c) initial cultures are slow in growth so that the plate may be discarded before the organism has grown out.

Symptoms in our patient simulated psychosis, subdural hematoma, and finally meningo-encephalitis of undetermined origin. In meningeal involvement, common symptoms are headache, dizziness, vertigo, and stiffness of the neck and back. Later, a great variety of mental disturbances may appear. Physical signs commonly suggest a chronic meningitis with stiffness of the neck and back. Other signs include cranial nerve disturbances, papilledema, hyperactive and finally absent deep reflexes, and hemiplegia. Fever commonly is slight or absent, with mild, if any, elevation in pulse rate. Late in the disease, urinary tract and pulmonary infections are frequent complications. The average duration of life after onset of symptoms is from 1 to 6 months, although survival for more than 5 years has been reported.

*Differential diagnosis*

Tuberculosis and syphilis may be ruled out by appropriate laboratory and clinical examination. Neoplasms and abscesses may provide considerable difficulty. The diagnosis may have to await operation and biopsy. Subdural hematoma may provide considerable difficulty, as in this case.

The chief difficulty may be offered by other mycotic organisms. Those more commonly entering into the differential diagnosis will be

North American blastomycosis, coccidioidomycosis, actinomycosis, moniliasis, and sporotrichosis.

North American blastomycosis is characterized by suppurative and granulomatous lesions especially in the skin, lungs, and bones. In about 30 percent of the patients, central nervous system lesions occur. Like the cryptococcus, it produces a single bud from the parent cell. Unlike the cryptococcus, cultures at room temperature will form mycelia bearing numerous oval to round conidia.

Coccidioidomycosis, in its fulminant form, often ends with terminal dissemination to the central nervous system. The most reliable differentiating feature is the organism itself, which is large ( $20\mu$  to  $80\mu$  in diameter), nonbudding, spherical, and filled with numerous endospores (each  $2\mu$  to  $5\mu$  in diameter). On Sabouraud's agar at room temperature, aerial mycelial forms are produced. The branching septate hyphae segment into numerous arthrospores. Inoculation into testes of guinea pigs leads to a severe purulent orchitis from which typical organisms containing numerous endospores may be demonstrated.

Actinomycosis may affect the central nervous system but is often preceded by cervicofacial, thoracic, or abdominal suppurative and granulomatous processes that commonly form draining sinuses. In tissues typical colonies of the "ray fungus" may be seen lying in a suppurative area. Gram-negative mycelia are present in tissues and cultures. Pathogenicity may be demonstrated on intraperitoneal injection of guinea pigs.

Moniliasis may occasionally lead to a purulent meningitis with an intense polymorphonuclear and lymphocytic response. The organisms appear as small, oval, thin-walled budding bodies  $2\mu$  to  $4\mu$  in diameter. In tissues, mycelial elements may or may not be present. Corn meal agar cultures produce mycelia and the characteristic thick-walled, round chlamydospores. Rabbits injected intravenously with *Candida albicans* die in 4 to 5 days and show numerous abscesses in the kidneys.

Sporotrichosis occasionally produces fatal meningitis. There is intense cellular reaction within the meninges, with polymorphonuclear leukocytes and lymphocytes in the spinal fluid. Often the organisms are few and cannot be readily demonstrated. Injection of infected material intraperitoneally into male white rats leads to peritonitis and orchitis. Within the purulent exudate, numerous gram-positive, cigar-shaped intracellular organisms are found. Cultures on Sabouraud's agar at room temperature produce delicate, branching septate hyphae bearing conidia laterally or in groups at the ends of lateral branches.

In one hospital, trained nurse anesthetists were usually available; in the other hospital, medical officers, without previous anesthetic training, administered the anesthetic. A standard gas anesthesia apparatus was always in readiness for the administration of oxygen or inhalation anesthesia if necessary. Blood pressure and pulse were checked frequently.

With the patient in position and ready for the perineal preparation the anesthetic was begun. The solution was injected slowly, 1 or 2 cc. at a time, until the desired level of anesthesia was reached. In most cases the anesthetic was light enough to preserve uterine contractions and in many the patient continued to bear down without excitement. After delivery the patient was maintained in light surgical anesthesia if a repair was necessary. Because of the flexibility of the anesthetic agent and the rapid response it produced, the obstetrician was able to control the level of anesthesia by offering suggestions.

Table 2 shows the amount of pentothal required for multiparas and primiparas. It will be noted that most of the cases required no more than 1 gm. and that a significant number required less than 0.8 gm. Some multiparas needed as little as 0.4 gm. Only 4.6 percent of the primiparas required more than 1 gm.

TABLE 2—Amount of pentothal sodium required

	Number of patients requiring—		
	Less than 0.8 gm	0.8 to 1.0 gm	More than 1.0 gm
Primiparas	30	72	5
Multiparas	38	64	2

## RESULTS

*Effectiveness of anesthesia*—Adequate depth of anesthesia was obtained in all cases. Within one-half to 1 minute after the drug was administered anesthesia was deep enough to permit delivery of the head over the perineum, episiotomy, or application of forceps. With most patients contractions continued without interruption and in many expulsive effort continued without excitement although there was effective analgesia and amnesia and between contractions the patient was asleep. It will be noted in table 1 that 60 percent of multiparous deliveries were spontaneous. This will serve as evidence that contractions and even expulsive effort continued in the majority of multiparas. In primiparas, contractions also continued in the majority of cases although only 24 percent were spontaneous deliveries because of the greater outlet resistance. This is not in accord with

the findings of Hellman et al.<sup>3</sup> and Dippel et al.<sup>4</sup> It seems to us that pentothal is not only a satisfactory anesthetic for spontaneous deliveries but that it made it easy to find and maintain light anesthesia without the excitement and attendant complications so often encountered in inhalation anesthesia.

Only 6 of 215 cases had to be supplemented with another anesthetic. Nitrous oxide and oxygen, with or without ether, was the anesthetic added. Of the 6 cases 1 was supplemented because the needle could not be kept in the vein, 1 because of laryngospasm, 2 because of shallow respirations (these latter 3 will be discussed) and 2 in order to secure uterine relaxation. Thus, the anesthetic effect was considered satisfactory in all but 6 (2.8 percent) of the series.

The attitude of the patients was invariably favorable. They frequently commented on the easy and rapid induction and were surprised to find that they awoke with little or no "hangover." Most patients awoke within 1 hour after delivery and postanesthetic vomiting was present in only a few isolated instances. These factors were especially helpful in our program of early ambulation.

*Anesthetic complications*—Difficulty was encountered in only 11 of the 215 cases and only 2 of the 11 were serious enough to be considered uncommon regardless of the anesthetic agent.

One patient had laryngospasm soon after induction before there was any stimulation of the perineum or rectum. The spasm was promptly relieved with the administration of oxygen and the introduction of an ordinary airway. Anesthesia was continued with nitrous oxide, oxygen, and ether and the delivery was completed without further event.

One patient had complete apnea for 90 seconds but began to breathe spontaneously and oxygen administered immediately relieved the cyanosis. Anesthetic was continued with gas, oxygen, and ether.

Five patients had shallow respirations but in only one of these cases was it considered necessary to resort to gas, oxygen, and ether. The remainder were carried without further difficulty when oxygen was administered.

Vomiting occurred in only two patients and neither of these aspirated. Both of these patients had vomited prior to the start of the anesthetic.

In two patients increased muscular tonus was observed and caused small tonic spasms of the extremities. This may have been caused

<sup>3</sup>HELLMAN, L. M., SHUTTLE, L. B.; MANAHAN, C. P.; and EASTMAN, N. J.: Sodium pentothal anesthesia in obstetrics. *Am J Obst. & Gynec.* 48: 851-860 Dec. 1944.

<sup>4</sup>DIPPEL, A. L., HELLMAN, R. J., WOLTER, C. E.; WALL, H. A. Jr. and HARRISON, F. H.: Sodium pentothal anesthesia for selected vaginal obstetrics. *Surg. Gynec. & Obst.* 83: 572-582 Nov. 1947.

by anoxia although in either case respirations were not impaired and no cyanosis was observed. The deliveries were completed under pentothal sodium without difficulty.

Thus anesthetic difficulty was encountered in 11 of the 215 cases (4.9 percent). Only 2 (0.93 percent) of the 215 cases, could be considered serious complications.

There were no remote anesthetic complications. No case of post-anesthetic pneumonia was encountered in this series. There were no maternal deaths.

*Fetal complications*—Condition of the babies on delivery was classified as: breathed and cried spontaneously, required mild stimulation, and required vigorous stimulation. Mild stimulation consisted of rubbing the back, aspirating the mucus, and an occasional slap on the feet. Vigorous stimulation included administration of oxygen, resuscitation by mouth to mouth breathing (no positive pressure oxygen apparatus was available) and stimulating drugs. The distribution of babies among these classifications shows that 184 (85 percent) breathed and cried spontaneously; 15 (7 percent) were sleepy and required mild stimulation; 12 (6 percent) were significantly depressed; in 4 (1.84 percent) the condition of the baby was not recorded; and 1 (0.46 percent) would not respond.

Among the babies with depressed respiration was one case thought to have intracranial hemorrhage following a difficult breech extraction with the cord wrapped about the neck three times. The child recovered completely and at 6 months was apparently normal.

Among the 216 babies (1 patient delivered twins) there were 6 fetal deaths. Two of these were macerated fetuses known to be dead prior to parturition. There were three anencephalic monsters, an unusual incidence, all of whom were born alive but died shortly after delivery. One baby could not be made to breathe although the fetal heart was heard immediately prior to delivery. Autopsy was not done but the baby appeared normal to external examination. The death could not be fully explained and therefore must be attributed to anesthetic depression. Of the 216 babies there was a gross fetal mortality of 6 (2.8 percent). The corrected mortality was 1 (0.46 percent).

#### DISCUSSION

The most common objections to the use of intravenous pentothal sodium in vaginal deliveries are the fears of respiratory depression and laryngospasm in the mother and respiratory depression of the baby. We were sufficiently impressed with these points to be wary about introducing this anesthetic in circumstances of limited equipment and personnel. Neither of these fears were materially realized

and we believe that the results presented here are an indication that intravenous pentothal sodium may be used safely in small hospitals with limited facilities provided only that certain reasonable care is employed.

The small incidence of maternal complications can hardly be explained by the fact that relatively small amounts of pentothal were used, for in those few cases where difficulty was encountered, it occurred soon after induction. Rather it appeared that occasionally a patient had some special sensitivity to the anesthetic. Later in the series we adopted the practice of starting inhalation oxygen with the induction and this practically eliminated respiratory difficulty. Stimulation of the perineum seemed to have no tendency to cause laryngospasm as is commonly thought to be the case with stimulation of the anus.

The good result with the babies must be attributed to our effort to keep the time between induction and delivery as short as possible. Although, unfortunately, no specific record of this time was kept, it usually did not exceed 10 minutes. No special effort was made to hurry delivery but rather the anesthetic was not started until all was in readiness for delivery. This is in accordance with the finding of Hellman et al.<sup>5</sup> that the concentration of pentothal in the infant's blood begins to rise appreciably after 9 minutes and soon approximates that of the mother's blood. In those cases of our series where the anesthetic was prolonged prior to delivery, the babies were visibly less alert and responsive but did not constitute a real problem.

The enthusiastic attitude of the patients to the anesthetic, because of the easy and rapid induction and the absence of undesirable after-effects, was a strong argument for us to continue its use once its safety had been established. We found that the lack of aftereffects helped induce the patients to early ambulation.

In addition to the vaginal deliveries, four cesarean sections were done under intravenous pentothal sodium with considerably less favorable results. All the babies required resuscitation and one, an 8-month premature baby, was particularly slow to respond and died several hours after delivery. The only finding on autopsy was atelectasis. The unduly depressed state of the infants might well be attributed to the larger amounts of pentothal required and the somewhat longer time elapsing from induction to delivery. From this limited experience we believed that pentothal was not a suitable anesthetic for section and, therefore, discontinued its use in such cases

<sup>5</sup> HELLMAN, L. M. SHUTTLES, I. B. and STRAN, H. Quantitative method for determination of sodium pentothal in blood. *J Biol Chem* 148: 297-297, May 1943



## CONCLUSIONS

It is our belief that intravenous pentothal sodium is a safe, efficient, pleasant anesthetic for vaginal deliveries, both spontaneous and operative. We believe that it is not indicated in cases of prematurity or when prolonged difficult delivery, especially with intra-uterine manipulation, is anticipated.

## SUMMARY

Two hundred and fifteen vaginal deliveries were performed under intravenous pentothal sodium in two Army hospitals in an overseas theater; maternal anesthetic difficulty was encountered in 11 cases, only 2 of which could be considered serious. There were no remote anesthetic complications or maternal deaths; gross fetal mortality was 2.8 percent with a corrected mortality of 0.46 percent.

Eighty-five percent of all babies cried spontaneously and only 6 percent required resuscitation. The absence of undesirable after-effects in the mothers aided in a program of early ambulation.

## BIBLIOGRAPHY

1. KASSEBOHM, F. A., and SCHRIFER, M. J. Intravenous anesthesia in obstetrics; comparative study of pentothal and equal soluble with report of 250 cases. *Am J Surg* 40: 377-383, May 1938.
2. GREENHILL, J. P.: Anesthesia in obstetrics. *Am J Obst. & Gynec* 54: 74-81, July 1947.
3. ALLEN, F. M.: Intravenous obstetrical anesthesia, preliminary report. *Am. J Surg* 70: 283-290, Dec 1945.
4. RUCKER, E.: Intravenous anesthesia in obstetrics. *Virginia M Monthly* 70: 35-37, Jan 1943.
5. LE BECQUET, F. C.: Intravenous anesthesia in obstetrics. *New England J Med* 219: 654 1938.
6. HOLLMAN, L. M., SHETTER, L. B., and STRAN, H.: Quantitative method for determination of sodium pentothal in blood. *J Biol Chem* 143: 294-297, May 1943.
7. GOODY, C. L., and SCHWARZ, H. F.: Sodium pentothal anesthesia in obstetrics. *West J Surg* 56: 278-284, May 1948.
8. DELISCHACH, R., and SNYDER, F. F.: Effect on fetus of pentobarbital sodium and pentothal sodium. *J. Pharmacol & Exper Therap* 79: 250, 1949.



# Cyst of the Mandible

## Report of a Case With Prosthetic Restoration

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**N**EOPLASTIC lesions of the mandible often present perplexing problems in surgery and prosthodontia. The oral surgeon and the prosthodontist must work in close cooperation if a satisfactory functional and cosmetic result is to be obtained. The following case report illustrates some of these problems in surgery and operative dentistry.

### CASE REPORT

On physical examination in September 1944, the patient, a 22-year-old soldier, was found to have a cyst in the right mandible. This was curetted and he returned to duty but the lesion continued to grow and he was admitted to a general hospital on 30 September 1946 because of a recurrence of this cyst. The lesion was reported as being an eosinophilic granuloma by some and as an adamantinoma by others. The entire right side of the mandible was resected (fig 1) and later pieces of ilium were used as a bone graft. The bone grafts failed to unite in two places at first but union of the graft with the left half of the mandible was finally obtained; however, nonunion persisted in the middle of the graft. The patient was transferred to Letterman General Hospital where a piece of the left tibia was removed for an osteoperiosteal graft on 3 January 1948. When the right mandible was opened a small pocket of pus was encountered and after curetting the purulent area at the site of nonunion, the wound was closed. The graft was buried in the abdominal wall. On 5 April the osteoperiosteal graft was removed from the abdominal wall and found to be viable. The jaw was opened and the scar tissue was removed from the bone ends. The graft was placed in the area of nonunion and fixed with tantalum wires (fig 2).

The jaw had been immobilized by a special dental prosthetic splint, but this had to be removed because of erosion of the mucous membranes overlying the ramus of the mandible. Various methods of splinting were tried and the use of the jaw was encouraged in order to stimulate union. It was thought that the patient had enough mandible for good function if a prosthesis could be constructed to immobilize that portion of the jaw. This was accomplished.

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# Erythema Exudativum Multiforme (Stevens-Johnson Syndrome)

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**A**LTHOUGH erythema exudativum multiforme is considered a rare entity, a review of the literature indicates that the condition is more common than previously supposed. Because the average physician is not familiar with this disease it is frequently misdiagnosed. The purpose of this review is to further familiarize physicians and students with the clinical picture and management as an aid to more accurate diagnosis and treatment.

This disease was originally described by Hebra in 1866, by Fliessinger and Rendu in 1916, by Stevens and Johnson in this country in 1922, and by Baader in 1925. Various names for this condition have been used: erythema exudativum multiforme (Hebra); ectodermose erosive pluriorificielle (Fliessinger); a new eruptive fever associated with stomatitis and ophthalmia (Stevens and Johnson), and dermatostomatitis (Baader). Much of the confusion in diagnosis is caused by the multiplicity of names and we believe that the original term used by Hebra is satisfactory and should be adopted.

Erythema exudativum multiforme is an acute systemic disease more common in males. The age incidence seems to be between 23 months and 19 years, although patients over this age have been reported. A group of 54 patients was studied at Duke Hospital by Noojin and Callaway (1) who stated, "It is significant that out of the fifty-four selected members not one was a Negro, although there is seen one Negro patient for every three whites at the Medical Clinics of Duke Hospital." It has long been recognized that the disease has a definite seasonal variation, occurring more commonly in the spring and fall seasons. The onset is usually abrupt and characterized by fever ranging from 102° to 106° F and lesions involving the skin, respiratory tract, and mucous membranes—chiefly those of the conjunctiva, mouth, pharynx, ure-

thral meatus, and anus. These lesions vary in severity, and in rare instances cutaneous lesions are completely absent.

A distinct cause for this disease has not been proved but the consensus is that the process is a sensitivity reaction of certain persons to any one of a variety of allergens. This may include foods, drugs, and many toxic substances. Howard and Wible (2) state, "Nose and throat pathology is undoubtedly a greater factor in the etiology of erythema exudativum multiforme than is generally realized." In their series of cases, it was their opinion that half could be directly attributed to sensitization by chronic infection in the tonsils and sinuses and that eradication of these foci was good prophylaxis against repeated attacks. In our series, one patient developed the disease following exposure to embalming fluid while working in a mortuary. He recovered completely and was free from symptoms until October 1948, when he returned home and again worked in a mortuary for the first time since his original attack. In another, it was believed that sulfadiazine was the sensitizing agent; and another was tattooed on the left forearm 1 week before the onset, and it was most interesting to observe that the only cutaneous manifestations in this case were bullous lesions in the area in which the red dye, apparently cinnabar, had been injected. Bacteriological studies on our cases, including throat and conjunctival smears and cultures, revealed only the usual flora of these locations. No inclusion bodies could be found on smear. This conforms with previously expressed opinions that eliminate a specific infection.

In spite of the severity of the disease, when seen in the acute phase, the prognosis regarding life is good, and death is rare. Only five fatal cases have been reported in the literature; in three of these, death was caused by bronchopneumonia (3). It should be strongly emphasized that this disease is potentially dangerous to the eye and may result in destruction of sight. Duke-Elder (4) believed that in the milder form of erythema exudativum multiforme, the lesions of the eye may heal in a few weeks without scarring, whereas, in the more severe forms the conjunctival lesions may persist for years. In the protracted eye cases, scarring of the bulbar and palpebral conjunctiva frequently results in obliteration of the fornices with corneal opacities and ulcers.

The most important conditions to be considered in the differential diagnosis of erythema exudativum multiforme are drug eruptions, foot-and-mouth disease, pemphigus vulgaris, Vincent's angina, and chickenpox.

Drug eruptions may be difficult to distinguish. The drugs most commonly causing bullous eruptions are sulfonamide compounds, barbiturates, phenolphthalein, iodine, inorganic arsenic, and antipy-

rine. The cutaneous lesions caused by these drugs may simulate the erythema multiformelike eruptions of the skin and mucous membranes, but are not usually as extensive or severe. Oral lesions are rare but have been known to occur. A careful history with special reference to drug ingestion will further help to differentiate the two.

The lesions of foot-and-mouth disease may resemble those of erythema exudativum multiforme, but may be differentiated by the limitation of the cutaneous lesions to the skin near the mucocutaneous junctions and to the fingers and toes. A virus may be demonstrated by guinea pig inoculation in most cases of foot-and-mouth disease.

Although pemphigus vulgaris involves the skin and mucous membranes, it is not too difficult to differentiate it from erythema exudativum multiforme. The onset of pemphigus is gradual, the course is chronic, there is an older age incidence, and tracheobronchial involvement does not occur.

Vincent's angina does not cause bullous lesions on the mucous membranes, skin lesions are absent, and stained smears from the mucous lesions reveal the typical *Spirilla* or fusiform organisms, or both.

The lesions of chickenpox appear in crops and are smaller than those found in erythema exudativum multiforme. The disease usually runs a mild course and the vesicles dry up in 2 or 3 days.

It has been the authors' privilege to have had under their care nine patients with erythema exudativum multiforme in the past 5 months, all of whom were severely ill and most of them had extensive mucous membrane lesions. All patients responded well to the treatment used and recovered without residual effect. Four of our patients were treated with aureomycin and they will be discussed more fully.

The treatment of this disease comprises local and general measures. In the past, in spite of varied treatment, the average patient recovered rapidly and was free of the disease within 3 or 4 weeks. Because of the severity of the oral and pharyngeal lesions, it is frequently impossible for these patients to take adequate nourishment and liquids by mouth. The general measures adopted in our cases to combat the dehydration and general toxemia included 3,000 to 4,000 cubic centimeters of intravenous fluids daily to which had been added 100 mg of thiamine chloride, 100 mg of sodium ascorbate, and 25 mg of nicotinic acid. In the rare cases with pronounced anemia, blood transfusions are indicated. Crysticillin, 300,000 units, was given intramuscularly every day to combat secondary infection. Two of our patients received sulfadiazine and sulfathiazole (0.5 gm. of each, four times daily). No objective or subjective difference was noted between the patients receiving sulfonamides and those not receiving them. One patient was given cristicillin for the first 3 days; aureomy-

cin then became available and was substituted, 1 gm. orally 3 times daily. Forty-eight hours after the institution of aureomycin the conjunctivitis had resolved by 95 percent. On the eighth hospital day there was 80 percent resolution of the lesions of the penis and on the eleventh hospital day the only lesions remaining were on the under surface of the tongue, the left corner of the mouth, and a very small crust on the foreskin. As a result of the apparent specificity of aureomycin for this condition we were encouraged to follow this form of therapy shortly afterward when three additional cases were admitted within a 48-hour period. Three days after admission aureomycin was begun in a dosage of 1 gm., three times daily. The only other therapy consisted of boric acid eyewashes, hydrogen peroxide mouthwashes, and intravenous fluids. These three patients were excellent for study purposes: one had a mild form of the condition without evidence of vesicles, although he had lesions of the mouth, nose, urethra, and fore-skin; the second case was moderate in that in addition to the lesions of the mucous membranes the patient had a few scattered vesicles of the face and chest; the third patient had a severe form of the disease, his entire torso being covered with large bullae. After 8 days of aureomycin therapy we were convinced that this drug was no more effective than the penicillin and sulfonamides had been. There were no complications but the condition in no way responded more rapidly in these patients than in our earlier ones.

Our last patient was admitted following the trial with aureomycin. No therapy, other than boric acid eyewashes, hydrogen peroxide mouthwashes, and intravenous fluids, was given and this patient responded as well as any of the preceding eight.

In the treatment of local lesions strict oral hygiene must be undertaken. A cleansing mouthwash such as one-half strength hydrogen peroxide was used to free the tenacious mucus that accumulated in the mouth and pharynx. The mouth lesions were painted three times per day with 1 percent aqueous gentian violet solution. In cases of extensive involvement with laryngeal lesions and possible obstruction, facilities for emergency tracheotomy or intubation should be available. Weeping and oozing lesions of the scrotum, penis, and skin were treated with boric acid compresses and topical applications of 1 percent gentian violet. The eye lesions are most important and, because of the frequent and dangerous complications, were followed daily by the ophthalmologists. Local measures in the eye consisted of boric acid eyewashes, 30 percent sulfacetimide solution every 6 hours, penicillin ointment every 6 hours, and atropine ointment every 8 hours.

After the acute phase of the disease has subsided a thorough investigation for all foci of infection is recommended as a prophylactic measure against recurrence.

## CASE REPORT

An 18-year-old white man entered the hospital on 8 October 1948, complaining of a head and chest cold of 8 days' duration and soreness of the mouth, which began 2 days prior to admission. This illness began while travelling from Florida to San Diego. At the onset, the patient also suffered from headache, inflammation, photophobia, and lacrimation of both eyes, anorexia, and nasal congestion. Shortly after the onset, he began to have attacks of chills and fever, and pains in the chest which were aggravated by severe coughing. Dysphagia began 2 days before admission and burning on urination occurred on the morning of admission.

*Past history*—Inquiry into the past history of the patient revealed that he had had a similar attack in 1946, at which time he received penicillin treatment and recovered in 7 days. Prior to the attack he was working in a mortuary. It may be significant to note that while the patient was on leave, just prior to his present attack, he again worked in the mortuary for 1 week.

*Physical examination*—Physical examination revealed a well-nourished, young man with a temperature of 103.4° F, pulse 108, respiration 24, and blood pressure 135/80. He was uncomfortable, coughed frequently, and brought up copious amounts of mucopurulent, blood-tinged sputum. Vision was normal, but both bulbar and palpebral conjunctival surfaces were inflamed and drained a mucopurulent discharge. There was no involvement of the sclera. Examination of the mouth disclosed edema of the gingiva, soft palate, and uvula, many areas of inflammation and ulceration of the soft palate and gums, and a thrushlike membrane over the tongue, palate, and buccal mucosa. The lips were fissured and bleeding. Wheezes and rhonchi were heard throughout both lung fields with moist râles in the left base and right midposterior chest. There was slight inflammation of the urinary meatus with a purulent discharge. The skin at this time was normal.



Figure 1—Bullous lesions of the penis and scrotum



Figure 2—Vesicular and bullous lesions of the arms and chest, crusting and fissuring of the lips, and conjunctival involvement



Figure 3.—Vesicular and bullous lesions of the upper and lower extremities.

On 11 October the scrotum became red and began to itch. Laryngoscopic examination revealed slight swelling in the valvular region with some difficulty in swallowing saliva. On 12 October a few reddish papules appeared on the right side of the thorax, posteriorly. The urethral discharge had increased considerably and was purulent. The mucous membrane of the glans penis began to slough and large vesicular and bullous lesions appeared over the foreskin and skin of the penis (fig. 1). On 13 October vesicular and bullous lesions appeared on the upper and lower extremities and chest (figs. 2 and 3).

*Treatment and hospital course*—The patient was treated with from 3,000 to 4,000 cubic centimeters of intravenous fluids daily, to which had been added 100 mg. of thiamine chloride, 100 mg. of sodium ascorbate, and 25 mg. of nicotinic acid. Crysticillin, 300,000 units and sulfadiazine, 4 gm., were given daily. All oral lesions were painted three times daily with 1 percent gentian violet, and one-half strength hydrogen peroxide was used as a mouthwash. The patient was observed carefully by the ophthalmologist for formation of adhesions of the conjunctivae and for corneal involvement. The eyes were



Figure 4.—Erythema iris type lesions involving the chest and face and hemorrhagic crusting and fissuring of the lips.



# Listerella Monocytogenes Meningitis

## Report of a Case

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**L**ISTERELLA MONOCYTOGENES causes an infection in rabbits in which an excess of mononuclear cells in blood is a striking feature. This organism has been recovered from infectious mononucleosis in man and animals, and in meningeal infections in man. Since 1935 when Burn (1) first described a case of meningo-encephalitis caused by the organism *Listerella monocytogenes*, 24 cases have been reported.

The role of this organism in man and animals has been thoroughly reported by Juhanelle (2) and more recently by Kaplan (3).

Although the disease is relatively rare in man, the mortality rate ranges from 63 to 70 percent (2) (3). However, with the advent of the sulfonamides, the death rate has greatly decreased. Porter and Hale (5) achieved good results by use of sulfanilamide and sulfapyridine in protecting mice from lethal doses of *Listerella*.

Foley, Epstein, and Lee (4) found that each of their 7 strains of *Listerella* grew freely in 40 times the concentration of penicillin necessary to completely inhibit the growth of other gram-positive organisms. They therefore assumed that *Listerella* was penicillin-resistant.

In spite of these reports, the strain of *Listerella* recovered in the case reported here was found to be more sensitive to penicillin in vitro than to either sulfadiazine or streptomycin.

### CASE REPORT

On 19 May 1949 a 32 year-old white man was admitted to a naval hospital complaining of a severe headache of 14 hours duration. On admission he was delirious.

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According to his wife, he was apparently well the day prior to admission and he had worked the entire day at his job as a metal die caster. After a large dinner he took a nap for about 1 hour. When he awoke he complained of a slight headache and went to bed.

At 2300 the patient was restless and his temperature was 104° F. A physician gave him an injection of penicillin and he was hospitalized.

The past and family histories were noncontributory.

Physical examination revealed an acutely and seriously ill man. The temperature was 104° F.; pulse, 80; respirations, 20; and blood pressure, 154/84. The neck was stiff, and Kernig's sign was positive, while Brudzinski's sign was negative. The general physical examination was otherwise essentially normal. Complete neurological examination (as far as the cooperation of the patient permitted) was normal except for a positive Babinski reflex on the left.

A spinal puncture, performed soon after admission, showed a pressure of 340 mm. water. The pressure was slowly reduced to 200 mm. water. The spinal fluid was slightly turbid and smears revealed many small gram-positive rods.

Thirty minutes following the spinal puncture the patient's sensorium cleared considerably and the headache was definitely relieved. Fourteen hours after admission severe headache accompanied by delirium returned and a spinal puncture was again performed. At this time the spinal fluid pressure was 520 mm. water, and the fluid was definitely cloudy. The pressure was again reduced to 200 mm. water with immediate relief of symptoms; the blood pressure, which had risen to 180/120 prior to the second spinal puncture, returned to normal.

One more therapeutic spinal puncture was necessary to relieve the headache the following day, 38 hours after admission. The spinal fluid pressure at this time was 190 mm. water, and the fluid was still cloudy.

A 48-hour culture of the spinal fluid showed small gram-positive rods in pure culture. Blood cultures taken on admission were negative. On the third hospital day a specific diagnosis of *Listerella monocytogenes* meningitis was made.

During the next 7 days, repeat spinal punctures were performed for penicillin, sulfadiazine, and streptomycin levels as well as spinal fluid chemistry. Throughout this period, the temperature was returning to normal by lysis and the patient was relatively asymptomatic. On the ninth day of hospitalization the patient had a generalized, follicular, morbilliform type of skin eruption, which responded promptly to antihistaminic drugs and the discontinuation of sulfadiazine and streptomycin. (In vitro studies were now available showing the organism more sensitive to penicillin than to either sulfadiazine or streptomycin.)

The remainder of the hospital course was unremarkable. Penicillin was gradually decreased, and discontinued at the time of discharge on 11 June 1949, 23 days after admission.

Follow-up studies at monthly intervals have failed to reveal any abnormalities in the electrocardiogram, blood, urine, or spinal fluid.

#### Laboratory findings

Complete red and white blood cell counts after 20 May 1949 were within normal limits. The results of the Davidsohn test, blood Kahn test, and the test for cold agglutinins were within normal limits.

#### BACTERIOLOGY

The organisms were small gram-positive rods, approximately 0.5 $\mu$  in breadth and 1 to 2 $\mu$  in length. They were nonencapsulated, and non-spore-bearing. They

# The Retromolar Area

## Its Significance in Full and Partial Denture Construction

AUGUST BARTELLE, *Commander (DC) U. S. N.*<sup>1</sup>

THE pear-shaped pad of tissue lying distally from the position of the mandibular third molar and formed by the external and internal oblique lines has been known variously as the retromolar area, retromolar triangle, retromolar papilla, or retromolar pad. The importance of this pad of tissue with its underlying structures and its relation to full and partial denture construction has frequently been overlooked. The failure to include this pad of tissue in the mandibular impression, or cutting the resulting impression of this pad from the distal extension of the finished mandibular full or partial denture, will result in early destruction of the mandibular alveolar ridge. This destruction is accompanied by loss of retention, stability, centric relation, vertical dimension, and comfort.

The retromolar pad consists principally of loose connective tissue, within which are located the retromolar mucous glands (1). Below the pad are the terminal fibers of the temporal muscle which forms part of the retromolar area (2), the pterygomandibular raphe, and that part of the buccinator muscle which arises from the raphe (3). Below these structures is the thick periosteum covering the floor of the retromolar fossa (1). The bone is of the cortical type, forming a thick band distally from the third molar alveolus. It is functionally active in furnishing attachment for muscles and is, therefore, a relatively stable bone (4).

The soft character of the mucosa with the resilient character of the fibrous attachments in the submucosa make this pad of tissue ideal for post dam. This post dam is important in mandibular full denture retention. The dense bone below these structures affords support for the mandibular full or partial denture and resists the forces of mastication.

Anteriorly to the retromolar area, the crest of the residual alveolar ridge is covered with dense fibrous connective tissue (5). Below this

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is a thin layer of cortical bone and varying amounts of spongy bone where atrophic changes are common (1). The character of the tissue and bone anterior to the retromolar area predisposes to failure of the denture if terminated in this area (fig. 1). Four cases are presented where the partial or full denture failed because it terminated anteriorly to the retromolar pad.

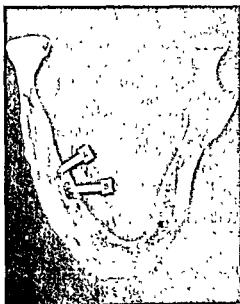
Some factors, such as clasp design, that may contribute to the failure of the partial denture are shown in the illustrations. These factors will not be discussed in this article.

#### CASE REPORTS

*Case 1.*—The patient had been wearing a maxillary full denture and a mandibular lingual bar partial denture for about a year. His chief complaint was that his anterior alveolar ridge was sore and that he could not masticate his food properly.

Examination revealed an inflamed mucosa under the denture in the maxillary central and lateral incisor area. There was loss of occlusion in the molar area and a  $\frac{1}{2}$ -mm space between the teeth. The saddles of the mandibular partial denture did not include the retromolar area. The mandibular alveolar ridge in the molar region revealed apparent absorption of the supporting bone.

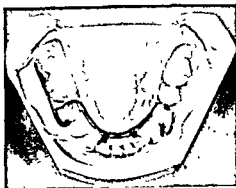
Failure to include the retromolar area in the saddles of the mandibular partial denture (fig. 2) had caused the forces of occlusion to absorb the alveolar bone



*Figure 1.*—At A (retromolar area) bone is of the dense cortical type. Partial and full dentures should terminate here. At B, bone is of the thin cortical and spongy type. Atrophic changes are common under stress if the denture is terminated here.



*Figure 2.*—Case 1. Mandibular partial denture with saddles short of the retromolar area.



*Figure 3.*—Case 2. Mandibular partial denture with saddles short of the retromolar area.

resulting in a loss of vertical dimension and discomfort in the anterior maxillary region.

A redesigned partial denture was constructed with extension of the saddles into the retromolar area with correct centric and vertical dimension.

*Case 2.*—The patient had been wearing a mandibular lingual bar partial denture for 3 months.

His chief complaint was that his mouth was sore, and that excessive amounts of food got under the partial denture. He had had several adjustments during the 3-month period, but did not obtain relief.

Examination revealed the teeth in the partial denture set up in cross bite relation. The tissue-bearing area of the saddles was small and appeared to be far less than the patient could tolerate. The retromolar area was not included in the saddle (fig. 3).

The partial denture was ill-fitting because of cross bite and inadequate saddles.

A new partial denture was constructed which corrected the cross bite, extended the saddles into the retromolar area, and which enlarged the tissue bearing area to the tolerable limits of the muscle attachments. This new partial denture has now been worn 26 months with the masticatory function satisfactorily restored.



Figure 4—Case 3. Partial denture in place on stone cast.



Figure 5—Case 3. Dark lines indicate retromolar area. Broken lines indicate denture area where extensive destruction of the alveolar ridge was apparent.

*Case 3.*—The patient was wearing a maxillary full denture and a mandibular lingual bar partial denture. While removing the denture, he accidentally severed a blood vessel in the floor of the mouth with one of the clasps. He was referred to the Prosthetic Department for a new prosthetic appliance.

Examination of the mandibular alveolar ridge revealed extensive destruction of the supporting bone. The retromolar area had not been included in the denture area (figs. 4 and 5). There was definite loss in vertical dimension and centric relation.

A new maxillary full denture and a new mandibular partial denture extending the saddles into the retromolar area was constructed.

*Case 4.*—The patient was wearing full maxillary and mandibular dentures. He stated that his mandibular denture was "very loose." About 1 month previously he had had both maxillary and mandibular dentures rebased to improve their retention.

Examination revealed that the maxillary denture was satisfactory. The mandibular denture had no retention; the tissue-bearing area in the posterior of the right and left sides was inadequate, and did not include the retromolar area (fig. 6). The vertical dimension and centric relation were satisfactory.

The mandibular denture was rebased, extending the tissue-bearing area to the tolerable limits of the muscle attachments and over the retromolar area. This denture has been worn satisfactorily for a year.



Figure 6.—Case 4 Mandibular full denture with saddles short of the retromolar area.

### SUMMARY

Four cases are presented in which partial or full dentures failed. In the cases presented, the dentures failed in the loss of retention, stability, centric relation, vertical dimension, and comfort because the retromolar area was not included in the denture area. The importance of the retromolar area in full and partial denture construction should not be overlooked.

### REFERENCES

1. PENDLETON, E. C : Influence of biologic factors in retention of artificial dentures J. Am. Dent. A 23: 1248, July 1936
2. HARRIS, H. L. : Anatomy of mouth and its relation to upper and lower full denture construction J. Am Dent A. 18: 1220-1226, July 1931.
3. EDWARDS, L. F, and BOUCHER, C. O. : Anatomy of mouth in relation to complete dentures. J. Am. Dent A. 29: 331-345, Mar. 1942
4. SWANSON, J. H : Retromolar area and its relation to adjacent structures J. Am. Dent. A 29: 44-49, Jan 1942
5. PENDLETON, E. C : Minute anatomy of denture bearing area J Am Dent A. 21: 488-504, Mar 1934.



# The Hanger Cephalin Cholesterol Flocculation Test and the Maclagan Thymol Turbidity Test

## Correlation With Autopsy Findings

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THE cephalin cholesterol flocculation and the thymol turbidity tests have many clinical advantages in determining the extent of liver damage and the differentiation of its various forms. Actually these reactions do not test any known function of the liver and should more properly be regarded as indicators of disturbed liver metabolism rather than as specific liver function tests (1).

The more recently described reaction, the thymol turbidity test, was first reported in 1944 by Maclagan (2) when "in the course of work on the serum colloidal gold reaction it was noted that the thymol which was used to inhibit the growth of mold in the barbitone buffer produced a marked turbidity or precipitate with certain sera, usually those from patients who had parenchymatous liver disease." Making use of these observations, he devised the thymol turbidity test as "an indicator of liver dysfunction." In a series of clinical cases he determined that this test was about 91 percent reliable in infectious hepatitis and about 52 percent reliable in Weil's disease.

At first it was supposed that the underlying mechanism of these two tests was the same. However, as more clinical cases were studied, many instances were found in which these tests were not at all in agreement or in which they agreed in only certain stages of the disease (3). The variation in different stages of the same disease is perhaps best illustrated in infectious hepatitis where the cephalin cholesterol flocculation test becomes abnormal first and the thymol turbidity test remains positive long after the cephalin cholesterol flocculation test has returned to normal (4).

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Many investigators, among them Recant, Chazgaft and Hanger (5), Cohen and Thompson (6), and Kunkel and Holland (7), have proved that, biochemically, the mechanisms of these tests are not the same. Electrophoretically, an increased gamma globulin was found in all sera showing a positive thymol turbidity test, as had previously been shown in cases with an abnormal cephalin cholesterol flocculation test. Immunological methods have failed to demonstrate a qualitative abnormality of this gamma globulin even though the gamma globulin present in multiple myeloma does not produce a positive thymol turbidity test. It is apparent that both of these tests depend on the gamma globulin content of the serum but in different fashions not yet fully investigated nor understood.

The degree of elevation of the thymol turbidity test appears to be directly proportional to the degree of lipemia present, and the extraction of all lipids from a positive sera prevents the reaction which can again be made positive by the addition of lipids from a normal serum. Thus, it is believed that in the thymol turbidity test the gamma globulin determines whether the reaction will be normal or abnormal, while the lipemia present determines the elevation of the test. This perhaps explains why no correlation has been found between the severity of symptoms and the degree of elevation of the thymol turbidity test (7).

Also, unlike the cephalin cholesterol flocculation test, it has been noted that the thymol turbidity test decreased in liver disease following the intravenous administration of large amounts of concentrated serum albumin over a period of days (7). This has been confirmed in various laboratories where an elevation of the serum albumin decreased the thymol turbidity reaction (4).

Some of the advantages claimed for the thymol turbidity test are as follows:

(a) An easier reagent to prepare with weighed amounts of chemicals which do not require aging.

(b) A more stable and less photosensitive agent than the cephalin cholesterol.

(c) A satisfactory test that can be performed on sera after several weeks' refrigeration.

(d) The results on nonfasting specimens are slightly higher than on fasting specimens but less in error than the cephalin cholesterol flocculation test.

(e) An accurate and reproducible result free from subjective estimation and error.

(f) A rapid determination: completed in  $1\frac{1}{2}$  hour instead of 48 hours.

(g) Fewer false positive reactions.



(h) *Appears to be more often normal in uncomplicated obstructive jaundice than the cephalin cholesterol flocculation test.*

(i) *A test of definitely more diagnostic value in following convalescent cases of infectious hepatitis.*

(j) *A test that is easily checked since it is normally elevated in dogs and rabbits.*

The emphasis placed upon these 2 tests of liver dysfunction is apparent in the more than 200 articles published in the past 10 years. The clinical and biochemical aspects have been and are being extensively investigated.

The authors of this article believed that a correlation of these tests should be attempted in which not the clinical but the autopsy diagnoses are used. The purpose of this article is to present such a correlation.

Case records and autopsy findings at the Cook County Hospital during 1947 and 1948 were reviewed. Of these, 100 cases were found in which pathologic change was noted in the liver and in which cephalin cholesterol flocculation and thymol turbidity tests had been done. In 91 cases, a total protein determination with A/G ratios was also available. The liver disease was not necessarily the cause of death nor the primary disease of the patient and in no case was death due to cholemia.

The average age of the patients was 57 years. The average time interval between performance of these tests and death was 14 days. In four cases, the thymol turbidity test had been elevated previously and was normal just prior to death, while in two cases, the same occurred with the cephalin cholesterol flocculation test. For the purpose of this report, only the last determination prior to death is used.

The cephalin cholesterol flocculation test was performed by the technique of Hanger (8) as modified by Neefe and Reinhold (9). A flocculation of more than 2+ in 48 hours was considered abnormal.

The thymol turbidity test was performed in accordance with the technique recommended by MacLagan (1). A turbidity of over 4 units was considered abnormal. The thymol flocculation test, as suggested by Neefe and Reinhold, was not recorded.

The serum total proteins, albumin and globulin concentrations were determined after the photoelectric method of Kingsley (10). The normal range of total serum proteins was taken as 6.5 to 8.0 gm. per 100 cc.; the albumin as 4.0 to 5.5 gm. per 100 cc.; the globulin as 1.5 to 3.4 gm. per 100 cc.

Of these 100 cases, 122 distinct pathologic diagnoses were determined on gross and microscopic examination of the livers. These diagnoses were divided into 12 groups (table 1).

TABLE 1.—*Distribution of the abnormal cephalin cholesterol flocculation and thymol turbidity tests by groups*

Groups	Abnormal CCF <sup>1</sup> only	Abnormal TT <sup>2</sup> only	Both tests abnormal	Neither abnormal	Total cases
Cirrhosis with jaundice.....	1	9	14	5	29
Cirrhosis without jaundice.....	0	0	0	1	1
Congested liver.....	0	0	0	19	19
Fatty liver.....	1	10	2	0	11
.....	0	2	2	1	5
.....	1	5	5	5	11
.....	3	3	6	0	12
.....	0	3	1	1	5
.....	0	2	0	0	2
Malignant biliary obstruction with infection.....	1	4	3	0	8
Malignant biliary obstruction without infection.....	0	4	0	2	6
Miscellaneous.....	0	2	1	3	6
Total.....	7	44	34	37	122

<sup>1</sup> Cephalin cholesterol flocculation<sup>2</sup> Thymol turbidity.

The groups were arranged to include cases with a variety of specific lesions in which similar liver damage was found at autopsy. Table 2 lists the percentage efficacy of these tests by groups.

TABLE 2.—*The percentage efficacy of the cephalin cholesterol flocculation and thymol turbidity tests alone and together by groups*

Groups	Number of cases	Percentage efficacy of the CCF <sup>1</sup>	Percentage efficacy of the TT <sup>2</sup>	Percentage efficacy of both tests
Cirrhosis with jaundice.....	29	51.7	79.3	82.7
Cirrhosis without jaundice.....	1	0	0	0
Congested liver.....	19	0	0	0
Fatty liver.....	11	23	92.3	100
.....	5	0	80	80
.....	16	37.5	62.5	68.7
.....	12	75	75	100
.....	5	0	80	80
.....	2	0	100	100
.....	8	12.5	87.5	100
.....	6	0	66.6	66.6
.....	6	0	50	50
Average percent efficacy.....		27.9	63.9	69.6

<sup>1</sup> Cephalin cholesterol flocculation<sup>2</sup> Thymol turbidity

## DISCUSSION

The first group is made up of 29 cases of Laënnec's type cirrhosis with jaundice as a result of this disease. No cases of biliary cirrhosis were included in this group, these having been listed under the appropriate causes of obstruction. Since only about 20 percent of the cases of Laënnec's cirrhosis might be expected to develop jaundice and this usually as a preterminal or terminal event, we would anticipate finding distinct pathologic changes in these livers. This was true in all 29 cases. However, in 5 of these cases both tests were

entirely normal, and in only 14 cases were both tests abnormal. If only one test was abnormal it was more likely to be the thymol turbidity by a ratio of 9:1. This same ratio has been reported elsewhere in cases of cirrhosis (11). MacLagan originally reported 13 abnormal thymol turbidity tests in 13 cases of cirrhosis while Stillerman (11) reported 96 percent reliability of the thymol turbidity test in 48 cases of clinical cirrhosis. Most of the reports in the literature, however, have indicated a percentage reliability of about 70 percent (3) (12). As can be seen in table 2, the percentage reliability of the thymol turbidity test in our 29 cases of cirrhosis with jaundice was 79.3 percent while the cephalin cholesterol flocculation test was 51.7 percent reliable. Using both tests, one or the other, or both indicated liver disease in 82.7 percent of the cases. Theoretically, we would expect to find a high percentage of reliability of the thymol turbidity test in cirrhosis since all the factors which tend to elevate this test are present. That is, a high gamma globulin, a high lipid, and a low albumin level in the blood (4). The explanation of this discrepancy must await further studies on the basic mechanism of this test.

The second group included only one case of cirrhosis without jaundice in which neither test was abnormal.

In the third group were 19 cases of congestion of the liver. These included chronic passive congestion, and congestion occurring in the terminal state. The gross and microscopic findings in the liver were similar to those found in congestive heart failure, although in only one case was this the cause of death. Positive thymol turbidity values have been reported in from 30 to 55 percent of patients suffering from various types of heart disease (11) (13). That this was not simply the result of congestion of the liver was pointed out when it was noted that the presence or absence of circulatory failure did not appear to influence the results of these tests (11). Similarly, in our 19 cases, simple congestion of the liver did not cause either test to be abnormal.

Thirteen cases were diagnosed as fatty infiltration of the liver. This is a stage through which a number of parenchymatous diseases of

twentieth days (14) of illness, at which time the blood lipid level is also high (4) and at which time some fatty infiltration may first be seen in liver biopsies. Our findings in 13 cases of fatty infiltration also showed a high percentage of reliability for the thymol turbidity test (92.3 percent) while the cephalin cholesterol flocculation test which is less affected by blood lipids was only 23 percent reliable in

indicating liver disease. One or both tests were abnormal in all cases.

Five cases of primary carcinoma of the liver were found in which no obstruction was apparent. Four of these (80 percent) had abnormal thymol turbidity values while in all five the cephalin test was normal. The elevated thymol turbidity values could not be correlated with the extent of liver replacement by tumor since an average of 20 to 80 percent of the liver parenchyma was grossly and microscopically normal in each case. This has also been noted elsewhere. S. S. Sclerman reported that 7 of 15 cases of neoplastic disease had abnormal thymol turbidity tests but whether the process was primarily in the liver or metastatic is not stated.

Of the 16 cases with metastatic carcinoma of the liver without biliary obstruction, both tests were abnormal in 5, neither test was abnormal in 5, an abnormal thymol turbidity test only was noted in 5, and in 1 case the cephalin test alone was abnormal. Kunkel, working with clinical material, found a number of cases with metastatic neoplasia in the liver which showed abnormal thymol turbidity values and normal cephalin cholesterol flocculation tests. Here again, the abnormal values could not be correlated with the extent of parenchymal destruction.

Toxic hepatitis, more frequently caused by toxicity associated with disease other than that due to drugs or poisons, was evident in 12 cases at autopsy. In three cases the thymol turbidity test alone was abnormal, in three cases the cephalin test alone was abnormal, while in six cases both tests were abnormal. Thus each test was 75 percent reliable and together they indicated disease in all 12 cases. Popper and Franklin (14) in studying 21 clinical cases of toxic hepatitis with biopsy specimens, found that most of these cases had abnormal values for the thymol and cephalin tests but found that in a number of cases both tests were normal when considerable damage was indicated by the biopsies and other laboratory tests. Evidence suggests that many acute infectious diseases have an associated toxic hepatitis, for some investigators have reported that as many as 37.5 percent of patients with acute infections have abnormal thymol turbidity tests which return to normal during convalescence (11).

Five cases were classified as benign biliary obstruction with infection, and two cases as benign biliary obstruction without infection. In neither group was the cephalin test alone abnormal, while the thymol turbidity test was 80 percent reliable in the presence of infection and 100 percent reliable without infection of the biliary tract. From the literature it might be expected that both tests would be more reliable in the cases of obstruction with infection but our groups here

are quite small and perhaps with a greater number of cases this would be true. The poor correlation of the extent of disease with the cephalin cholesterol flocculation test, and good correlation with the thymol turbidity test, has been observed elsewhere in cases of biliary obstruction (7).

Of the 14 cases with malignant biliary obstruction, 8 had associated infection of the biliary tract and 6 were without infection. An abnormal cephalin test alone was noted in only 1 of these 14 cases while in 3 cases with infection both the cephalin and thymol turbidity test were positive. In considering all 21 cases of biliary obstruction together we do find that the thymol turbidity test is about 10 percent more reliable in the presence of infection. Popper and Franklin reported 73 cases of biliary obstruction, 33 of which were due to cancer and 40 were of benign origin. They also noted that most of their cases showed normal cephalin tests while the thymol turbidity test was slightly elevated.

The miscellaneous group included one case of multiple myeloma in which the total proteins were 10.4 gm per 100 cc. of which 9.2 gm. was globulin. This patient had a normal thymol and cephalin test 1 day prior to death. At autopsy the liver was large and the seat of myelomatous and moderate fatty infiltration. The second case was that of miliary tuberculosis with diffusely scattered tubercles throughout the liver. Here again, both tests were normal. A third case was found to be Hodgkin's disease in which the liver was enlarged and showed a diffuse infiltration of the lymphomatous process.

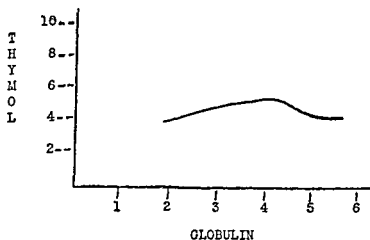


Figure 1—A mean distribution curve of 91 cases with the mean thymol turbidity value in Maclagan units plotted against the globulin level in the blood in gm per 100 cc.

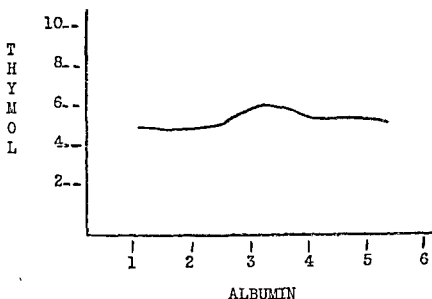


Figure 2.—A mean distribution curve of 91 cases with the mean thymol turbidity values in MacLagan units plotted against the albumin level in the blood in gm. per 100 cc.

In this case the thymol turbidity was 16.8 units and the cephalin test was 4+ in 48 hours. A case of pernicious anemia had an abnormal thymol and normal cephalin test. At autopsy, the liver was found to have a central necrosis of all lobules. One case diagnosed as a reticulum cell carcinoma of the lymphoid tissues had an abnormal thymol and normal cephalin test. The liver was diffusely infiltrated by the carcinomatous disease. The last case was one of nutritional anemia in which both tests were normal. At autopsy, generalized moderate atrophy of the liver cords was noted with an over-all brownish pigmentation and no evidence of regeneration. To determine what relation the thymol turbidity in MacLagan units might have to the globulin level in the blood, a mean distribution curve was prepared (fig. 1). Ernst and Dotti (12) found a mean deviation of 1.8 in 522 thymol turbidity values on 500 supposedly normal individuals. While in those suffering from disease not considered to involve the liver, a mean deviation of 2.7 was found in 538 tests on 527 hospitalized patients. Figure 1 has a deviation of less than these observers found in normal subjects and we can conclude that the thymol turbidity test, in units, bears no relation to the total globulin level of the blood. Similarly, when a mean distribution curve is prepared using the albumin level in the blood, no significant deviation is apparent (fig. 2). While therapeutically elevating the albumin level may lower the thymol turbidity reading in an individual case, the initial thymol reading does not appear to be significantly related to the initial albumin level of the blood.

- 5 REICANT, L.; CHARGAFF, E.; and HANGER, F. M.: Comparison of cephalin-cholesterol flocculation with thymol turbidity test. *Proc Soc. Exper Biol & Med* 60: 245-247, Nov. 1945.
- 6 COHEN, P. P., and THOMPSON, F. L.: Mechanism of thymol turbidity test. *J Lab & Clin. Med* 32: 475-480, May 1947.
- 7 KUNKEL, H. G.: Value and limitations of thymol turbidity test as index of liver disease. *Am. J. Med.* 4: 201-207, Feb 1948.
- 8 HANGER, F. M.: Serological differentiation of obstruction from hepatogenous jaundice by flocculation of cephalin-cholesterol emulsions. *J Clin Investigation* 18: 261-269, May 1939.
- 9 NEFFE, J. R., and REINHOLD, J. G.: Photosensitivity as cause of falsely positive cephalin-cholesterol flocculation tests. *Science* 100: 83-85, July 28, 1944.
- 10 KINGSLEY, G. R.: Direct biuret method for determination of serum proteins as applied to photoelectric and visual colorimetry. *J. Lab & Clin Med* 27: 840-845, Mar 1942.
- 11 STILLERMAN, H. B.: Thymol turbidity test in various diseases. *J. Lab & Clin Med.* 33: 565-572, May 1948.
- 12 ERNST, R. G., and DORR, L. B.: Evaluation of thymol turbidity test. *Am. J M Sc* 216: 316-320, Sept. 1948.
13. CARTER, A. B., and MACLAGAN, N. F.: Some observations on liver function tests in diseases not primarily hepatic. *Brit M J* 2: 80-82, July 20, 1946.
14. POPPER, H. (Chicago), and FRANKLIN, M.: Diagnosis of hepatitis by histologic and functional laboratory methods. *J. A. M. A.* 137: 230-234, May 15, 1948.



# Anterior Fixed Bridges

## A Technique for Construction by Means of One-Piece Casting

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THE paucity of literature available on construction of anterior fixed bridges by means of one-piece castings leads to the belief that this method is not in common use. Should this premise be correct, it is regrettable, for bridges constructed by the technique described here have been found to be stronger, easier to seat, and therefore subject the teeth to less torque; in addition, it effects a saving in chair and laboratory time. It is necessary to have only two sittings: the preparations and impressions are made at the first sitting and the completed bridge is inserted at the second.

A detailed discussion of the preparation of the abutment teeth to receive the three-quarter crowns will not be given. However, the preparations must be precise and all surfaces should be made as smooth as possible with sandpaper disks and fine finishing stones. The importance of cutting parallel grooves cannot be overemphasized. The mesial grooves of the abutment teeth must be cut parallel to each other and the distal grooves cut parallel to the mesial. To accomplish this a long-pointed Boley millimeter gage is used; the points are coated with carbon or indelible pencil and the mesial surfaces of both abutment teeth are marked. The mesial grooves are cut and, when completed, the positions of the distal grooves are marked in the same manner, using the mesial grooves as a guide. It follows then that all four grooves must be parallel. This is important in the construction of anterior fixed bridges by any method but is mandatory when using the one-piece casting technic.

A number of impression materials<sup>2</sup> may be used with good results but their preparation for use is not as simple as with some elastic im-

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<sup>2</sup> The material used should not have to be soaked in hardening solution as the change in dimension, after soaking for 15 minutes, is deleterious to the finished model



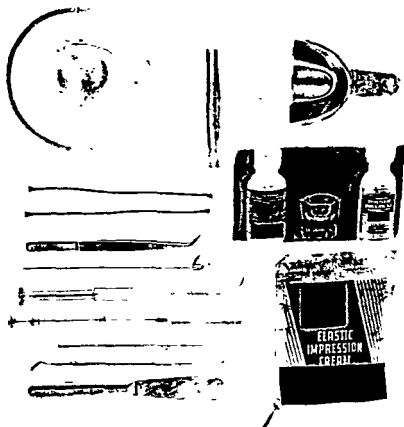


Figure 1.—Equipment required for making impressions.

pression creams. The equipment required for the latter is a rubber bowl, a plaster spatula, cement spatula, a 5-cc. glass or metal syringe and a shortened 18-gage needle (fig. 1).

Prior to taking the impression, the gingival tissue must be pushed back 2 or 3 mm. from the finish line of the preparation. This is accomplished by inserting a piece of string saturated with an astringent (dental glycerite on the Supply Table or a 20-percent solution of zinc chloride) under the free margin of the gingival tissue; the diameter of the string used is comparable to that of a 14-gage wire. The initial insertion of the string is made at a point on the labial surface a few millimeters anterior to the mesial labial wall of the preparation and is gently pushed in place under the mesial, lingual, and distal gingiva with an instrument such as Woodson's No. 2 plastic. Undue trauma must be avoided for it will tear the tissue from its attachment





*Figure 3.*

When setting of the stone model is complete, it is separated and trimmed to remove all surplus material. That part of the model that represents the overhanging free margin of the gingival tissue is carefully removed to permit free access to the finish line of the three-quarter crown preparations of the abutment teeth. At this point the model is further trimmed to receive the necks of previously selected facings and the facings are tentatively arranged in the space to be bridged although no attempt is made to grind them in. The stone

is placed in an ice water bath that covers approximately 1 inch of its base and is permitted to chill for 30 minutes. The stone model is next carefully removed and another model is poured, using cristobalite model investment. Upon separation the stone and cristobalite models should be carefully examined to insure that exact duplication has been attained.

To permit free access to the distal surfaces of the abutment teeth for the purpose of contouring the wax three-quarter crowns and for establishing contact points, it is necessary to split the cristobalite model into three sections. This is accomplished by first trimming and beveling the base of the model and scouring its under surface. The



erythrocytes have been tried in this study, many more remain to be examined. The view previously expressed (1) on the possibilities for bringing into the light other positive hemagglutinations is, therefore, still being held.

The results recently reported by others on the agglutination of sheep cells by Japanese encephalitis and by Lansing viruses could be shown to be brought about not by the virus, but by the mouse-brain tissue, as such, present in the virus suspension. Verlinde and de Baan (5) have also stated that uncentrifuged normal mouse brains, even greatly diluted, agglutinate sheep cells. Attention is drawn to the fact brought out here and supplemented by the experiments reported in an earlier article (1) that the technique of hemagglutination by neurotropic viruses as contained in mouse-brain suspensions should be carefully controlled with respect to its variables to avoid confusion with nonspecific, nonviral agglutinations. One of the variable factors that appears to be significant is the degree of clarification of the viral suspension, since the degree of nonspecific reaction has been shown to be apparently correlated with the relative intensity of clarification of such suspensions obtained by means of centrifugation.

### CONCLUSIONS

itis, as the Coxs from 25

indicate that normal mouse brain in suspension may give false positive agglutinations.

### REFERENCES

1. OLITSKY, P. K. and YAGFR, R. H. Hemagglutination by Columbia SK, Columbia MM, mingo-encephalomyelitis and encephalomyocarditis viruses, experiments with other viruses. *Proc. Soc. Exper. Biol. & Med.* 71: 719-724, Aug. 1949.
2. HALLAUER, C.: Agglutination von Hammeleerythrocyten durch Murine Polio-myelitis-virus Stamme. Fourth International Congress of Microbiology, Copenhagen, Denmark, July 20-26, 1947. p. 257.
3. LARUELL, O. and HORSFALL, F. L., JR. Hemagglutination with GDVII strain of mouse encephalomyelitis virus. *Proc. Soc. Exper. Biol. & Med.* 71: 713-718, Aug. 1949.
4. BRUMER, A., and MUTSAERS, W. Agglutination des Globules Rouges de Mouton par le Virus de la Poliomyélite (Souche Lansing). *Compt. rend. Soc. de biol.* 142: 1194-1196, Sept. 1948.

5. VERLINDE, J. D., and DE BAAN, P.: Sur l'Hémagglutination des Virus Poliomyélitiques Muins et la Destruction Enzymatique des Récepteurs de Virus Poliomyélitique de la Cellule Réceptive. *Ann. Inst. Pasteur* 77: 632-641, Nov. 1949.
6. OLITSKY, P. K.; YAGER, R. H.; and MURPHY T. O.: Preservation of neurotropic viruses. *U. S. Armed Forces Medical Journal* 4: 415-417, Apr. 1950.



to 4 months (average 3 days) after the onset of symptoms. The pain was in no way related to the taking of food.

TABLE 1—Admitting diagnosis of 31 patients with *ancylostomiasis*

Appendicitis.....	10	Dysentery.....	1
Original correct diagnosis ( <i>ancylostomiasis</i> ).....	10	Intestinal obstruction.....	1
Gastro-enteritis.....	2	Tumor of sigmoid.....	1
Peptic ulcer.....	2	Perforated peptic ulcer.....	1
Food poisoning.....	1	Cholecystitis.....	1
		No abdominal pain.....	1

TABLE 2—Location of pain in 30 patients with *ancylostomiasis*

Epigastrium.....	9	Left lower abdominal quadrant.....	4
Right lower abdominal quadrant.....	8	Periumbilical.....	2
Right upper abdominal quadrant.....	6	Generalized.....	1

### CASE REPORTS

**Case 1.**—A 47-year-old laborer was admitted at 1500 complaining of a severe epigastric pain that came on suddenly after drinking a glass of water 4½ hours earlier. The pain was lancinating, localized, and accompanied by nausea. He had had periodic attacks of a similar but milder pain in the past several years. His conjunctivas and mucous membranes were pale. There was tenderness and cramping in the epigastrium and right upper abdominal quadrant. His temperature was 101.4° F., pulse rate, 100, and respiratory rate 22. The erythrocyte count was 3,610,000 with 70 percent hemoglobin. The leukocyte count was 10,200 with 2 percent eosinophils. A Levin tube was placed in the stomach and attached to a suction apparatus. The patient was given intravenous fluids. Serum amylase was 36. Within 8 hours all symptoms and signs had disappeared completely and the temperature was normal. Hookworms were found in the stools and were eliminated by appropriate treatment.

**Case 2.**—A 33-year-old chauffeur was admitted with a history of gradually increasing cramping pain of 1 week's duration in the right lower abdominal quadrant and right flank. In the past 2 years he had had two attacks of a similar, but less severe pain. Although the present attack was unaccompanied by nausea or vomiting, the patient noted that his stools were softer than normal. A mild burning on urination had been noted several times in the immediate past. On physical examination, superficial and deep tenderness in the mid-abdominal region was noted. Slight tenderness was present in the right costo-vertebral angle. The erythrocyte count was 3,762,000 with 75 percent hemoglobin; leukocyte count was normal, but repeated differential counts showed 5 or 6 percent eosinophils. Two successive stool examinations disclosed hookworms. The patient was treated and discharged cured.

### COMMENT

These patients have presented a difficult problem in diagnosis; we have to recognize them largely by the varied clinical findings. The symptoms and signs do not follow the general pattern of events seen in acute conditions within the abdomen. Most of these patients have been undernourished and have shown evidence of anemia. We

treat them expectantly and observe them closely. The signs and symptoms usually improve promptly and stool examination confirms a diagnosis of hookworm. We have been aided by a staff of trained technicians who give us prompt and accurate reports of stool examinations. In this group of patients, none of whom were operated on, close observation and study prevented needless operations.

#### REFERENCES

1. MONAT, H. A., and COOPER, I. S.: Duodenal ulcer and hookworm infestation; diagnostic and military medico-legal problem. *U. S. Nav. M. Bull* 47: 33-342, March-April 1947.
2. YENIKOMSHIAN, H. A., and SHEHADI, W. H.: Duodenal ulcer syndrome caused by ankylostomiasis; report of 25 cases with gastric acidity and roentgenological studies. *Am. J. Roentgenol.* 49: 39-48, Jan. 1943
3. McEWAN, D.; ECONOMON, J. G.; and ZELLNER, R. L.: Mistaken surgical diagnoses in hookworm disease. *South Surgeon* 13: 760-766, Oct. 1947.





Many, whose motives are purely selfish, or at least show little evidence of higher ideals, will accept service willingly enough merely because of their liking for certain phases of it. Some accept it as a means of escape from an unsatisfactory environment. Others accept it because there is no other way out.

The incentive to serve well can be killed even in men with the finest motivations, through bad handling and disillusioning experiences. At all stages in the soldier's career the desire to serve must be fostered. It is stupid to promote enthusiasm by sentimental exhortation and promises and then kill it in the early days of service. First impressions of service life are apt to be the most lasting. Introduction to hard training should be gradual rather than a sudden application of discipline that is so often practiced. Never is intelligent leadership more significant than in the early stages of training. Once a man can see the reasons for regulations and has the feeling that he is being fairly dealt with, he usually adapts himself quickly to the needs of the group. Thereafter, if he can realize that the inherent strength of the group is greater than his own he is well on the way to becoming a good soldier. If, however, he conceives that he is an outcast or misfit, unfairly disciplined, or so badly treated that he becomes resentful, or is made to obey through fear alone, then his future usefulness to the Armed Forces will not be hard to predict. Unless he is "mentally rescued" by an improvement in man management or individual psychiatric attention he soon will become motivated to escape rather than to serve. In time, unless conditions are corrected, or even in spite of correction, he will, in all likelihood, either attempt to "work his ticket" out of the service through some form of dissimulation, become a chronic offender, or show neurotic behavior or evidence of a psychosomatic disorder.

Of course, mental or psychic breakdown can occur at any stage of training or operations, but it is believed that the most critical period is during the early stages of adjustment to the service. Emotional conflicts set up and not resolved at this stage, probably account for many of the disturbances that appear later when exposed to additional stress. There are those who still believe that early selection should eliminate all those with any neurotic behavior patterns (if it were really practicable to do so) and thenceforth they assume that neurosis will not occur. Certainly the experiences of the last war do not seem to bear out their contentions. Unselected men appeared to show no higher breakdown rate than those who were selected. Unfortunately there is no means of now knowing how well those who were turned down at examination would have done had they been accepted.

If we can then assume that the early period of transition from civil life to service environment is as important to the production of good

soldiers as is believed, let us consider some general principles in the machinery of selection and period of induction which would favorably or unfavorably influence success.

Let us begin with the individual, rather than the State or the requirements of the Armed Forces. In a free democracy, as opposed to a tyranny, the government or State exists through the collective will of all citizens supporting their freely nominated representatives by secret ballot. The necessity for voting at agreed intervals so that representatives may be tested as to their views or record against those of a contrary opinion is inherent in the system. The pros and cons of policy are freely debated before the people. It is theirs to choose. To avoid a chaotic multiplicity of group views, those of similar views usually group themselves into as few parties as possible. Since strength must be met by strength, there is a natural tendency to form into two main groups. But in the nature of things there must be not less than two groups if democracy is to survive. One-party rule inevitably leads to tyranny and the abolition of the ballot.

The free democratic citizen then is conditioned to freedom of expression. Indirectly, but surely, he influences his country's foreign affairs and through his individual ballot influences war or peace. If, before war he is opposed to war at any price, it will take a great deal of persuasion to overcome his distaste if war occurs. In the final analysis, he, as a free citizen, has the right to his opinion one way or another. He is conditioned to fighting out the pros and cons of his viewpoint at the polls and accepting the majority verdict with more or less good grace. Unless he can understand that war was inevitable or necessary and not the result of mismanagement by the people's representatives, his aversion to war is understandable.

In a cross section of the population there are all shades of viewpoint and all varieties of individual circumstances and social and financial pressures varying with the times. If a man is of military age and total manpower mobilization is necessary he is faced with suddenly relinquishing his freedom and being told either to work at a specific occupation or be inducted into the services. The entire pattern of his life may be changed overnight. The farmer, the office worker, the merchant, or student, whether self-employed or independent, must give up what he is doing and enter into a strange environment. He is usually beset by many difficulties incidental to winding up his affairs, or making special provisions for his family. No matter how willingly he sets out, it is a period of great emotional stress and uncertainty. He has heard many tales of glory and of death. He wonders what the fates have in store for him and invariably hopes for the best. He is in a very receptive mood for a guiding hand and a

need for discipline and self-control among those whom he understands than among complete strangers. There is plenty of time for wider and wider associations. Haste should be made slowly. Administrative and training plans disregarding this important concept will surely cause futile manpower wastage.

Above all, the initial examination, indoctrination, and common basic training centers set up must be most carefully staffed. This is a key position which demands officers and noncommissioned officers who possess a knowledge of human relations and are favorably known and respected throughout the area for good character, integrity, justice, and inborn leadership. There is no place here for martinets who know no other means of leadership than that of command through fear. There are unfortunately too many of them to be met later in the soldier's, sailor's, or airman's career, when it is hoped he has acquired a safer mental adjustment, or that the overt disciplinarian has been curbed through an enlightened policy. At the initial training center, the individual should begin to feel his common identity as a citizen and a soldier and that as a citizen he is not being set apart from others, but is to serve so as to most suitably express his free political will in opposition to the enemy. Having achieved that concept, his objectives become clearer. He can then settle down to pursue his mission in the war with resolution, knowing that the sooner it is successfully concluded, the sooner he can again employ his knowledge, experience, and new and old skills in the peaceful reconstruction which must follow.

The Armed Forces, however, can only proceed so far in their efforts to successfully utilize manpower. Unless the national morale has been so molded by national leadership both before and during war so that the masses of the people have pride and faith in their Armed Forces and the common cause, and wholeheartedly support them, the Armed forces cannot hope to achieve final success. In other words, the degree of faith and belief in the righteousness of the cause which is inherent in the national motivation and morale will directly determine the real effectiveness of the Armed Forces.



# About The Army Medical Department

## Medical Department Extension Courses<sup>1</sup>

HOWARD S. McCONKIE, *Colonel, MC, U. S. A.*<sup>2</sup>

EXTENSION courses of one or more of our Army schools are converted to correspondence courses. They were first used in the Armed Forces in March 1907 by the National Guard of the State of Indiana which at that time instituted a correspondence course in military medicine for its medical officers. In 1910, the War Department authorized a correspondence course for its medical officers, and in the following year the Army Field Service and Correspondence School for Medical Officers was organized as one of the Army Service Schools at Fort Leavenworth, Kans. This was authorized for members of the Regular Army Medical Corps only. The majority of our extension-course students today are Medical Service Corps officers and enlisted men desiring Reserve commissions in that Corps.

The Medical Reserve Corps of the Army was created in 1908. It was the first integral volunteer reserve ever organized in the Army. In 1915, a correspondence course was authorized for the several corps of the Medical Department Reserve. These were discontinued during World War I. They were reinaugurated at the Medical Field Service School at Carlisle Barracks, Pa., when the War Department established the army-wide correspondence system in 1922. That system remained in effect until the mobilization for World War II. Courses were prepared by the Medical Field Service School and were administered by the nine corps areas then in existence. Those subcourses<sup>3</sup> were normally graded by the Regular Army Medical Department personnel located nearest the student. Possibly such a grader was on

<sup>1</sup> Presented at First Army Medico-military Symposium, Governor's Island, 26 April 1950

<sup>2</sup> Chief, Extension Courses Department, Medical Field Service School, Brooke Army Medical Center, Fort Sam Houston, Tex

<sup>3</sup> Correspondence courses are herein referred to as subcourses

are sent to the student, but when a selected subcourse is requested, the department occasionally must write the student and enclose a mimeographed list of titles showing current availability. Some alternate subcourse is then usually selected by the student. On the other hand, if it develops that he needs the specific subcourse requested as a means of preparing to teach that subject, we find the material he needs in some other department of the school.

Certain National Guard and ORC officers have been provisionally commissioned with inadequate military training and they are generally required to complete the "10" and "20" series within 1 or 2 years. Their subcourses are sent to them 3 at a time so as not to hold them back. In order not to hold any other ambitious student back, the subcourses are sent to a student as fast as he can take them.

Although a complete series of extension courses is not now a prerequisite for promotion in the Reserve, it is one method of fulfilling requirements so that an officer's commanding officer can consider him for promotion. It is desirable for all officers of the Medical Service Corps Reserve to take almost all subcourses from the MFSS and certain administrative subcourses of the Adjutant General's School, especially the one entitled, "Disposition of Records." The Quartermaster School course on "Bookkeeping and Accounting" is also recommended. Eight of the subcourses in other schools are of definite value to company-grade officers. One of these covers hospital construction and is recommended for medical officers who are training for staff and command positions.

Clinical officers should take certain subcourses selected to suit their needs. We do not expect them to take complete series of subcourses. We want to help those who definitely desire help through this medium of training. Professional officers for the most part are earning "points" by other methods. It is a positive challenge to maintain the interest of the medical officers of our Reserve forces in the Reserve program. This is more particularly and understandably so in extension courses. In all fairness these officers desire to remain active but do not have the time to participate.

Medical units are now being organized in a special manner. The present concept of tables of organization for medical units places almost all of the clinical officers in the Professional Complement section. It is considered that the unit will be organized and given extensive training before the professional complement reports to the unit. This means that tremendous basic and unit training responsibility must be assumed by a few officers and the enlisted cadre. Because the training of enlisted cadres is extremely important almost all applicants for extension course enrollment from enlisted men are approved. When these men finish the "10" series, they are permitted to take selected

subcourses in a higher series commensurate with their MOS or their unit or instructional assignments. Many Regular Army enlisted men, through their correspondence activity and proved applicatory capabilities, will be commissioned as second lieutenants in the Medical Service Corps where they will be of great value in a mobilization. In preparing subcourses those subjects dealing with problems to be met in an army in the field have been given preference with second priority being given to the supporting agencies of such a field army.

Some ORC unit commanders wish their personnel to take certain subcourses before their unit's 2-week summer training camp. More units will be required to take such summer training under the new ORC program. Every possible aid is given to such prerequisite extension training as is set up by these unit commanders.

Extension courses may be taken by all military personnel regardless of status. This includes those on the inactive and honorary lists of the Reserve. In view of the close similarity between civil-disaster medical service and medical field service for the Armed Forces, it is expected that the National Security Resources Board, which has charge of planning civil defense on the Federal level will be able to use certain subcourses on evacuating procedures for selected civilian medical and allied science leaders.

Because unification is the order of the day, officers of the Army, Navy, and Air Force may take subcourses in any of the three departments. They should apply for such subcourses through their own branch schools. In January 1950 the Navy had 12 medical subcourses. *There are no tests on the lessons, the examination consisting instead of preparing a thesis on the subject matter.* One Navy student is taking an Army course and one Army student is taking a Navy course. The Air Force has no extension courses especially prepared for medical personnel but at least 34 Air Force Medical Department Reserve officers are taking Army courses. There may be more because we have had to rely on the student to tell us when he has transferred to the Air Force.

Four new courses are being planned at the Medical Field Service School to parallel our resident instruction on the "Medical Aspects of Atomic Explosion."

Each time our students are circularized with a news letter, warning, or even a Christmas greeting, there is a renewal of activity. This is the reason for the periodic publishing of a news sheet called "Training Report," which is being replaced by the "Medical Department Organized Reserve Corps Training Bulletin." Each branch of the Army will soon publish such a bulletin for their branch. A Reserve officer is assigned full time to the Office of the Surgeon General, De-

The material for this edition has been compiled by Americans from American material. Every effort has been made to have each section written by a well recognized authority on the subject. There are 14 chapters and 2 supplements. Such important subjects as radiation therapy in "Diseases of the Blood and Blood-Forming Organs," the circulatory system, the respiratory system and breasts, the gastrointestinal tract, the female genital organs, the genito-urinary tract, the nervous system, et cetera, to completely include the entire body and the glands of internal secretion. There is an outstanding and important chapter on "The Civil Liability of the Radiologist." The supplements discuss "Low Intensity Radium Needles" and "Dosage Calculation in Radium Therapy." This is an excellent book, not only for the radiologist, but for everyone in all the fields of medicine.—*Capt P Peterson (MC) U. S. N.*

INTRODUCTION TO NEUROPATHOLOGY, by Samuel Pendleton Hicks, M. D., *Departments of*

Company, Inc., New York, N. Y., publishers, 1950. Price \$10.

This text achieves the aims of the authors to introduce to medical students and residents in neurology and pathology the fundamentals of disease processes in the nervous system, and to stimulate an interest among general pathologists and neuropsychiatrists toward a closer correlation of their respective viewpoints.

In this work, neuropathology is brought to the general pathologist as an integral part of general pathology, and is presented in such a clear and concise manner that the reader becomes unaware that he is studying a subject which has long been considered complex. The text itself is brief but sufficient, because it is profusely illustrated with excellent, both gross and microscopic, black and white photographs. Charts and schematic drawings are also used to definite advantage. Much of the data presented is based on original work of the senior author. The pathologic physiology of the nervous system is discussed adequately, but the clinical pathologic correlation is neglected. An entire chapter is devoted to congenital anomalies of the nervous system, while only one or two paragraphs are given to such conditions as Wilson's disease and other degenerative diseases of the nervous system which are of special interest to the neuropsychiatrist.

The discussions may be too detailed for the medical student in his study of pathology. The bibliography is good and is quite sufficient. The general pathologist will receive the greatest benefit from this text because it brings neuropathology into the realm of general pathology, treating neurological disorders in their relation to the disease processes in the body as a whole. In spite of a few shortcomings the book is recommended to those interested in neurology and neuropathology.—*Lt (jg) P. K. Hamilton (MC) U. S. N.*

RESEARCH IN MEDICAL SCIENCE, edited by David E. Green, Ph. D., and W. Eugene Knox, M. D. 492 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$6.50.

It is the thesis of the authors that medical research is no longer an arena for clinicians alone. It was their hope to bring a better understanding of fundamental science to clinicians and a better appreciation of medical problems to non-medical investigators. This they have undertaken to accomplish by a series of 26 essays surveying the methods and problems of various specialized fields which impinge on the field of medicine. Although primarily intended for the scientific groups centering around medical interests it is suggested that the intelligent layman will find this a readable book. This reviewer believes the book will prove

profitable and interesting for the scientifically inclined but will make rather heavy going for those who do not have a firm foundation in some field of science. It definitely is not aimed for the layman.

The Anglo-American team of editors has assembled an international list of outstanding authors. The authors have faced the challenge of the editors and have put a strong case for their respective fields. The essays stand independently and each is concluded with its own bibliography. Here Menninger describes psychiatry as a "science" (the quotation marks his) resting on five isolated and inadequately correlated methodological pillars; Burnett discusses viruses; Wolman describes sanitary engineering as an art even though he qualifies it as a hybrid; Montagu describes anthropology as the integrative science of man; and Ingalls approaches the problem of congenital deformities as an epidemic; many other equally stimulating presentations are included.

The book has a table of contents but no index.

Often one hears reference to the romance of the laboratory sciences. Here one feels it astir close at hand. Enthusiasm for the subject runs through these essays like the pulse of a feverish patient. The reader's problem is not to decide which will be interesting but rather which must be read first. This book is recommended for all those who feel they need a lift from the rut of their own specialty and for those who wish to round out their medical scientific background but are pressed for time. This book deserves a wide reading within the medical profession and the allied sciences.—*Commander H. J. Alvis (MC) U. S. N.*

### BOOKS RECEIVED

Receipt of the following books is acknowledged. As far as practicable, they will be reviewed at a later date.

**SUPERVOLTAGE ROENTGENERAPY**, by Franz Buschke, M. D., Simeon T. Cantrill, M. D., and Herbert M. Parker, M. Sc., from *The Tumor Institute of The Swedish Hospital, Seattle, Washington*. 297 pages. Charles C Thomas, Springfield, Ill., publisher. 1950. Price \$10.50.

**NON-VALVULAR HEART DISEASE**, by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), M. A. C. P., Hon. F. R. C. P. (Can.), D. S. M. (A. M. A.), *Hersey Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts College Medical School, Sometime Physician-in-Chief, Carney Hospital, Sometime Visiting Physician, Beth Israel Hospital; Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital, Boston, Mass.* (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as that work.) 75 pages. Oxford University Press, New York, N. Y., publishers, 1950. Price \$2.

**BACTERIAL INFECTION With Special Reference to Dental Practice**, by J. L. T. Appleton, B. S., D. D. S., Sc. D., *Professor of Bacteriopathology and Dean, The Thomas W. Frank Museum and Dental Institute School of Dentistry, University of Pennsylvania*. 4th edition, thoroughly revised. 614 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$10.

**A TEXTBOOK OF ORAL HYGIENE AND PREVENTIVE DENTISTRY**, by Russell W. Bunting, D. D. Sc., *Professor of Dentistry and Dean of the School of Dentistry, University of Michigan*, and collaborators. 240 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$5.

**HANDBOOK OF PHYSICAL MEDICINE AND REHABILITATION**, Selections Authorized for Publication by the Council on Physical Medicine and Rehabilitation, American Medical Association. 573 pages; illustrated. Published for the American Medical Association by The Blakiston Company, Philadelphia, Pa., 1950. Price \$4.25.

**BIOLOGICAL STUDIES WITH POLONIUM, RADIUM, AND POLOTONIUM**, edited by Robert M. Fink, Ph. D., *Associate Clinical Professor of Physiological Chemistry, School of Medicine, University of California at Los Angeles, Research Chemist, Birmingham*



**A GUIDE TO GENERAL MEDICAL PRACTICE**, by Martin G. Vorhaus, M. D., *Attending Physician, Hospital for Joint Diseases, New York City*. 244 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$3.50.

**TEXTBOOK OF ENDOCRINOLOGY**, edited by Robert H. Williams, M. D., *Executive Officer and Professor of Medicine, University of Washington Medical School, Seattle*, with the

**A PRIMER FOR DIABETIC PATIENTS**, by Russell M. Wilder, M. D., Ph. D., F. A. C. P., *Professor and Chief of the Department of Medicine of the Mayo Foundation, University of Minnesota, Senior Consultant in the Division of Medicine, Mayo Clinic*. 9th edition. 200 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$2.25.

**NURSING CARE OF THE SURGICAL PATIENT** (formerly *Textbook of Surgical Nursing*, 4th edition, by McFee and Keller), by John Pettit West, M. D., *Attending Surgeon, St. Luke's Hospital, New York*; Assistant Attending Surgeon, *New York Hospital, New York*; Assistant Professor of Clinical Surgery, *Cornell University Medical College, New York*; Manelva Wille Keller, B. S., R. N., *Formerly, Chief Operating Room Nurse, St. Luke's Hospital, New York, and Anesthetist, St. Luke's Hospital, New York*; and Elizabeth Harmon, B. A., R. N., *Instructor in Surgical Nursing, Cornell University New York Hospital School of Nursing, New York*. Assistant Head, *Surgical Nursing Service, New York Hospital, New York*. 5th edition. 500 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$4.





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## Foreword

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The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case, experiment, or facts set forth should be clearly stated and should appear at the close.

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moplegia, cranial nerve involvement, and other focal neurologic manifestations occur. Systemic reaction is slight. Fever is seldom above 101° F., and the leukocyte count and sedimentation rate are within normal limits. Terminally coma supervenes, and the usual cause of death is respiratory failure. The diagnosis depends on the isolation of the yeast from the sputum or spinal fluid, with proof of pathogenicity by animal inoculation. The diagnosis should be considered in any case of chronic meningitis, and in any patient with roentgenographic evidence of pulmonary infiltration without apparent cause.

In 1861, Zenker reported a case of cryptococcosis of the central nervous system which was the first reported case of cryptococcal infection in man (2). In 1902, Frothingham (3) described a yeastlike fungus infection producing a mass in the lung of a horse. In 1905 von Hansemann (4) in Europe reported a case of blastomycosis of the central nervous system, which probably was cryptococcosis. In 1912 Rusk and Farnell (5) reported 2 cases of "systemic oidiomycosis" in the United States that undoubtedly were cryptococcosis. In 1916, Stoddard and Cutler (6) established cryptococcosis as a definite mycotic infection, that fulfilled Koch's postulates, and named the incriminating organism *Torula histolytica*, now designated *Cryptococcus neoformans*. In 1937 Levin (7) carefully reviewed the literature up to that time which, with 2 cases he reported, amounted to 60 cases. In 1941 Binford (8) added 14 cases from the literature and his own experience. Voyles and Beck (9), reviewing the literature and cases of their own, up to 1946, accounted for 108 cases. Up to 1919, 6 known cases had been reported in Great Britain. In 1946 Cox and Tolhurst collected data on 13 cases that had occurred in Australia in the preceding 10 years.

We have reviewed the literature since 1946 and have attempted to bring up to date the number of proved reported cases of cryptococcosis. Cases reported since Voyles and Beck's review in 1946 are as follows.

Rawson, Collins, and Grant (10) in 1948 reported a fatal case of central nervous system cryptococcosis, with systemic spread and necrosis of the adrenal glands with adrenal insufficiency. Mezey and Fowler (11) in 1946 reported one case of central nervous system cryptococcosis, in which they believed the toxic symptoms of the disease were caused by a toxin produced by budding yeast cells. Greening and Menville (12) reviewed 537,135 admissions to the Charity Hospital in New Orleans over a 10-year period and found only 4 proved cases. In 1947 Jesse (13) reported what he believed to be the first known case of cryptococcosis of the bone. Other cases have been reported by Hassin (14), Moody (15), Mider, Smith, and Bray (16), Neuhauser and Tucker (17), Reilly and Artman (18), Daniel, Schiller, and Volium (19), and Froio and Bailey (20).

*C. neoformans* in man more frequently involves the central nervous system, less frequently the viscera, nasopharynx, skin, lymph nodes, muscles, and bones. In the 60 cases reviewed by Levin in 1937 all infections involved the central nervous system. Of these 60 cases, 30 were reported as involving only the central nervous system, with 9 reported involving also the lungs, and 8 more being generalized, 1 of which did not involve the lungs. It is difficult to determine how many cases initially involved the lungs, but at least 16 cases in this report had lung manifestations in addition to central nervous system findings. Coincident involvement of the lungs occurred in 4 of Binford's 15 cases of central nervous system cryptococcosis, and in 1 of 6 cases of Reeves, Butt, and Hammack (21). Greening and Menville believed that in 83 of the 107 cases they reviewed the condition was confined to the central nervous system. In about 20 cases the lungs and the central nervous system were both involved, and in 4 cases the lungs alone were involved.

Reports of involvement of the lungs alone are rare and have been given by Sheppe (22) and Hardaway and Crawford (23), with an apparent recovery in the latter case. Sheppe reported a case, confirmed by necropsy, in which the right lung showed an organizing bronchopneumonia, with no evidence of central nervous system involvement. Hardaway and Crawford reported a case of cryptococcosis of the lung, in the absence of evidence of invasion of other organs, in which the patient remained under observation for 15 months, and when last seen was practically asymptomatic. The pulmonary lesions, however, showed little roentgenographic change during this time. They believed their case tended to confirm the opinion expressed by Stoddard and Cutler and Sheppe that cryptococcosis of the lungs offers a better prognosis than other types of infection with this organism.

The generalization of the mycotic process occurred in only 12 of 81 cases collected by Freeman (24), Levin, Binford, and Reeves, Butt, and Hammack, and invariably is fatal. There are a few cases in the literature in which the infectious process was localized and limited to certain parts of the body, and in which *C. neoformans* were recovered from the lesions. In 1906 Brewer and Wood (25) reported the first case of localized cryptococcosis, the case of a man with an abscess of the spine, apparently cured with drainage and curettement. Other localized infections with *C. neoformans* have been reported by McGhee and Michelson (26), Alvarez (27), Burger and Morton (28), and others.

The prognosis, except for the localized cutaneous type, is grave, especially in involvement of the central nervous system, which, until the advent of sulfonamides, was always fatal. Voyles and Beck stated



*Figure 1—India-ink preparation of direct smear from sputum showing characteristic morphologic appearance of Cryptococcus neoformans with large capsule and budding of the organism.*

revealed budding cells with halolike capsules morphologically characteristic of *C. neoformans*. Intraperitoneal injection of washings from these cultures into white mice caused the death of all infected animals within 8 days, and recovery of *C. neoformans* from them at autopsy. A roentgenogram of the chest on 10 September revealed a circular area of homogenous density, about 5 cm in diameter, in the right middle-lung field (fig 2). A lateral film of the chest placed the lesion in the right middle lobe (fig 3). Subsequent roentgenograms showed no significant change in the appearance of the lesion. Skin tests for tuberculosis and histoplasmosis were negative but the skin test for *Coccidioides* was 3 plus. On 14 October a specimen of blood was sent to Dr C. E. Smith for complement fixation and precipitation test for coccidioidial infection, and both were reported negative. Dr Smith reported, "We have had similar evidence that there is no cross reaction between cryptococcus and coccidioidial serologic tests."

The patient remained completely asymptomatic from the date of admission until 25 November when he complained of a slight dull headache on arising in the morning. On 24 September he was given an initial dose of 4 gm of sulfa-

diazine and subsequently received 1 gm. every 4 hours, night and day, until 7 December, when he refused all medication. During the period of sulfadiazine therapy, the blood level averaged about 10.5 mg. per 100 cc. On 24 September, 10 drops of a saturated solution of potassium iodide were given three times daily, and the dose was increased 1 drop daily to a total dosage of 75 drops three times daily. During this period the patient showed no symptoms or signs of toxicity to either drug. On 27 November he was given 0.4 gm. of streptomycin four times daily, in addition to the sulfadiazine and potassium iodide. This medication was continued until 7 December. Spinal puncture, on 30 November showed initial pressure of 200 mm. The fluid was clear, and the Queckenstedt test, globulin, protein, and sugar were within normal limits. The cell count was 8, with 4 polymorphonuclear cells and 4 lymphocytes. An india-ink smear revealed yeastlike organisms, morphologically characteristic of *C. neoformans*. A spinal puncture on 14 December showed initial pressure of 340 mm with a rise to 420 on straining. The fluid was crystal clear, and again revealed, on india-ink preparations, organisms morphologically characteristic of *C. neoformans*.



Figure 2.—Roentgenogram showing circumscribed dense infiltration in the peripheral portion of the right middle-lung field with little surrounding reaction.

The abnormalities found at autopsy were confined essentially to the lungs and brain. The middle lobe of the right lung showed a peripheral firm gray nodule (fig. 4), measuring 4 by 5 cm. Sections taken from this nodule revealed a peripheral zone, in which the alveoli contained numerous round to slightly oval, thick-walled organisms, with broad capsule (fig. 5). The meninges, from the cerebral cortex to the cauda equina, were infiltrated by moderate numbers of yeastlike organisms. A smear of fresh brain by the India-ink method, revealed numerous organisms, morphologically resembling *C. neoformans*. Cultures of brain tissue and cerebrospinal fluid also revealed these organisms.

### DISCUSSION

This case is reported not only because of the rarity of the disease and the complete pathologic report, but because it reopens the question of therapy. For years potassium iodide, in doses up to tolerance, has been used in the treatment of this disease for lack of a more effective drug. No cures effected by the use of this medication have been reported. Recently the use of sulfonamides has been advocated, and several cases have been described in which good results have been obtained, particularly as far as the prolongation of the life of the patient is concerned.

Smith (30) states that the prognosis is grave in all forms of cryptococcosis, but recommends that sulfadiazine be maintained in the blood at a level of 6 to 12 mg. per 100 cc. for a period of months. He further states that iodides have been of little value alone, but should be used to supplement the sulfadiazine. Voyles and Beck conducted experimental studies on animals infected with *C. neoformans* and came to the conclusion that potassium iodide and sulfadiazine, and a combination of the two drugs, showed no evidence of a beneficial therapeutic effect. In this experiment rats, rabbits, guinea pigs, and dogs were used.

Jones and Klinck (31) studied the therapeutic effect of sulfadiazine on experimental infections in mice and the effect of sulfadiazine and penicillin on organisms in vitro. They concluded that sodium sulfadiazine showed no demonstrable effect on *Cryptococcus*, that penicillin did not appear to inhibit the growth of the organisms in vitro, and that there was no known treatment of proved value.

Reilly and Artman experimented with white rats and concluded that sulfadiazine and streptomycin would prolong life, but that penicillin afforded slight benefit, and there was no advantage in combining penicillin and sulfadiazine. Vaccination employed in this study did not appreciably lengthen the life of the animals.

Solotorovsky and Bugie (32) reported that fungus infections have not responded well to chemotherapy. Penicillin and streptomycin have not been effective against fungi in vitro. This work confirmed that of Robinson, Smith, and Graessle (33), and Foster and Woodruff

(34). Bacitracin, polymyxin, and chloromycetin have not been shown to possess therapeutic activity against fungi that are pathogenic to man. Although streptothricin has been shown to inhibit the progress of cryptococcal infections in the mouse, according to Molitor (35) and Mushett and Martland (36) the use of this drug in human beings has not been effected because of its high toxicity in experimental animals. It was thought that streptothricin might be useful as a positive control for the evaluation of antifungal agents in vivo, but not for treatment in human infections. Other authors, commenting on penicillin, have reported it as affecting some strains of *Cryptococcus* but that it is of doubtful value in the treatment of patients.

Taber (37) stated: "the early surgical removal of a circumscribed area of torulosis seems as logical as the early removal of carcinoma." Surgery was not recommended in cryptococcosis of the central nervous system, or in generalized systemic spread. Dormer et al. (38) reported the case of a child with cryptococcosis of the right lung. The involved lobe was surgically removed, but central nervous system spread developed postoperatively. Froio and Bailey reported a case of pulmonary cryptococcosis in a 19-year-old man. The lower lobe of the right lung was surgically removed and 5 years and 7 months after the operation there was no evidence of meningeal spread or involvement of the left lung.

In our patient, lobectomy was seriously considered, because, on admission to the hospital, the roentgenogram of the chest and the finding of *C. neoformans* in the sputum were the only indications of cryptococcal infection; there were no cerebral symptoms at this time and the spinal fluid examination was negative. Sensitivity testing showed *C. neoformans* to be sensitive to polymyxin in vitro, but on actual treatment with this drug the infection did not respond. Other agents previously reported on, such as penicillin, streptomycin, sulfadiazine, and potassium iodide, to tolerance, were all used without success.

#### SUMMARY

A review of the literature revealed 127 proved cases of cryptococcosis to which one has been added. Although various therapeutic agents have been used in the past, no treatment has consistently proved beneficial in this disease. Patients showing pulmonary involvement of localized nature, in the absence of systemic spread, should be given the benefit of surgical removal of the involved lobe of the lung.

#### REFERENCES

1. CRAWFORD, R. L.: Textbook of Medicine. 7th edition. W. B. Saunders Co., Philadelphia, Pa., 1947. pp. 350-351.

2. FREEMAN, W. Torula infection of central nervous system. *J f Psychol u Neurol* 43: 236-345, Nov 1931
3. PROTHINGHAM, L. Tumor-like lesion in lung of horse caused by Blastomyces (Torula). *J M Research* 9: 31, 1902.
4. VON HANSEMAN, Ueber eine bisher nicht beobachtete Gehirnerkrankung durch Hefen. *Verhandl d deutsch path Gesellsch f Chir* 9: 21, 1905.
5. RISK, G. Y., and FARFELL, F. J. Systemic blastomycosis. *Univ California Publ, Path* 2: 47, 1912
6. STONARD, J. L. and CUTLER, E. C. Torula infection in man. Monograph 6, Rockefeller Institute for Medical Research, 1916
7. LEVIN, E. A. Torula infection of central nervous system. *Arch Int. Med* 59: 667-684, Apr 1917.
8. BINFORD, C. H. Torulosis of central nervous system, review of recent literature and report of case. *Am J Clin Path* 11: 242-251, Mar 1941
9. VOYLES, G. Q., and BECK, E. M. Systemic infection due to Torula histolytica (Cryptococcus hominis); report of 4 cases and review of literature. *Arch. Int. Med* 77: 504-523, May 1946
10. RAWSON, A. J., COLLINS, L. H., JR. and GRANT, J. L. Histoplasmosis and torulosis as causes of adrenal insufficiency. *Am J M. Sc* 215: 363-371, Apr 1948.
11. MEYER, C. M., and FOWLER, R. Cerebrospinal cryptococcus. *J A M A* 132: 632-634, Nov 16, 1946
12. GREENING, R. R. and MENAHER, L. J. Roentgen findings in torulosis, report of 4 cases. *Radiology* 48: 381-388, Apr 1947
13. JESSY, C. H. Cryptococcus neoformans infection (torulosis) of bone, report of case. *J Bone & Joint Surg* 29: 810-811, July 1947
14. HASSIN, G. B. Torulosis of central nervous system. *J Neuropath & Exper Neurol* 6: 44-60, Jan 1947
15. MOODY, A. M. Asphyxial death due to pulmonary cryptococcosis, case report. *California Med* 67: 105-106, Aug 1947
16. MINER, G. B. (Charlottesville Va.) SMITH, F. D., and BRAY, W. E., JR. Systemic infection with Cryptococcus neoformans (Torula histolytica) and Histoplasma capsulatum in same patient. *Arch Path* 43: 102-110, Jan 1947
17. NEUBAUSER, E. B. D. and TUCKER, A. Roentgen changes produced by diffuse torulosis in newborn. *Am J Roentgenol* 59: 807-815 June 1948
18. REEVE, E. B., and AETMAN, E. L. Cryptococcosis: report of case and experimental studies. *Arch Int Med* 81: 1-8, Jan 1948
19. DANIEL, P. M., SCHUBEL, F., and VOITTE, R. L. Torulosis of central nervous system, report of 2 cases. *Lancet* 1: 53-56, Jan 1949
20. FLORE, G. F. and BAILEY, C. P. Pulmonary cryptococcosis: report of case with surgical cure. *Dis Chest* 16: 354-359, Sept 1949
21. REEVES, D. L.; BUTT, E. M., and HAMMACK, R. W. Torula infection of lungs and central nervous system, report of 6 cases with 3 autopsies. *Arch. Int. Med* 68: 57-79 July 1941
22. SHUFFE, W. M. Torula infection in man. *Am. J M. Sc.* 167: 91-108, Jan 1924
23. HADDAWAY, R. M., and CRAWFORD, P. M. Pulmonary torulosis; report of case. *Ann Int Med* 9: 334-340, Sept 1915
24. FREEMAN, W. Torula meningencephalitis: comparative pathology in 19 cases. *Tr Am Neurol A* 56: 203, 1920.
25. BREWER, G. E., and WOOD, F. C.: Blastomycosis of spine. *Ann. Surg* 48: 889, 1908.

26. McGEHEE, J. L., and MICHELSON, I. D.: Torula infection in man. Surg Gynec. & Obst. 42: 803-808, June 1926
27. ALVAREZ, R. S.: Red torula as cause of tongue abnormality. J. A. M. A. 87: 1358-1359, Oct. 23, 1926.
28. BURGER, R. E., and MORTON, C. B.: Torula infection; review and report of 4 cases. Surgery 15: 312-325, Feb. 1944.
29. MARSHALL, M., and TEED, R. W.: Torula histolytica meningoencephalitis, recovery following bilateral mastoidectomy and sulfonamide therapy. J. A. M. A. 120: 527-529, Oct. 17, 1942
30. SMITH, D. T.: Pulmonary mycoses. Clinics 4: 994-1034, Dec 1945
31. JONES, S. H., and KLINCK, G. H., JR.: Torula histolytica (*Cryptococcus hominis*) meningitis; case report and therapeutic experiments. Ann. Int. Med. 22: 736-745, May 1945
32. SOLOTOVSKY, M., and BUGRE, E. J.: Effect of streptothricin on systemic infection with *Cryptococcus neoformans* in mice. J. Immunol. 60: 497-502, Dec. 1948.
33. ROBINSON, H. J.; SMITH, D. G.; and GRAISSE, O. E.: Chemotherapeutic properties of streptomycin. Proc. Soc. Exper. Biol. & Med. 57: 226-231, Nov 1944.
34. FOSTER, J. W., and WOODRUFF, H. B.: Microbiological aspects of streptothricin; antibiotic activity of streptothricin. Arch. Biochem. 3: 241-255, Dec. 1943.
35. MOLITOR, H.: Pharmacology of streptothricin and streptomycin. Ann. N. Y. Acad. Sc. 48: 101-117, June 1946
36. MUSHETT, C. W., and MARTLAND, H. S.: Anatomic changes produced by streptothricin. Fed. Proc. 5: 194, 1946
37. TABER, K. W.: Torulosis in man; report of case. J. A. M. A. 108: 1405-1406, Apr. 24, 1937.
38. DORMER, B. A.; FRIBLANDER, J.; WILES, F. J.; and SIMSON, F. W.: Tumor of lung due to *Cryptococcus histolyticus* (blastomycosis). J. Thoracic Surg. 14: 322-329, Aug. 1945.







# Tuberculin Testing of Midshipmen and Recruits of the Navy and Marine Corps<sup>1</sup>

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WHILE our information concerning the exact mechanism of the tuberculin reaction must be regarded as incomplete, it is now generally agreed that natural hypersensitivity to tuberculin is a result of tuberculous infection. In the clinical application of this fact it is very important to distinguish between tuberculous infection and tuberculous disease. From tuberculin surveys of our population and from autopsy material there is indication that the vast majority of tuberculous infections are promptly arrested and never produce tuberculous disease. Tuberculous infection, however, does leave its mark. The tissues of the host become sensitized to the products of *Mycobacterium tuberculosis* and this sensitization can be detected by the tuberculin skin test. The test, however, has its limitations. A positive result does not indicate the age of the infection or whether the infection is active or whether the infection has progressed to disease. It merely indicates that the person at some time in the past has been infected by *Myco. tuberculosis*.

Since January 1942 fluorograms of the chest have been a part of the routine examination to determine physical fitness of inductees and applicants for the Navy and Marine Corps. In the spring of 1948 the tuberculin test was made a part of this routine. The advantages to be gained from the mass tuberculin survey of recruits are considered to be as follows:

(a) The tuberculin test aids the roentgenologist and internist in deciding the significance of calcifications and infiltrates observed in the initial fluorograms.

<sup>1</sup>Read at the forty-sixth annual meeting of the National Tuberculosis Association in Washington, D. C., and scheduled for publication in "Transactions of the National Tuberculosis Association."

<sup>2</sup>Preventive Medicine Division, Bureau of Medicine and Surgery, Department of the Navy.

(b) The tuberculin test can be repeated when indicated, particularly in those persons exposed to tuberculosis, and close observation can then be made of those whose tests become positive.

(c) A repeat tuberculin test found to be positive and associated with a pulmonary infiltrate will serve not only as an aid in diagnosis, but also as an aid in determining the age and hence the significance of the lesion.

(d) The proportion of persons who have had a tuberculous infection prior to entering the service can be determined.

(e) A recorded negative tuberculin test on enlistment will assist in establishing or disproving service connection to tuberculous disease discovered later. If it is found that a substantial number of the men who have clinical tuberculosis incurred their initial infection while on active duty, it will indicate the need for better control measures within the service. The question of *Bacillus Calmette-Guérin* (BCG) vaccination can then be discussed on firmer ground.

This report deals with the results of tuberculin testing of recruits at one Marine Corps and two naval training centers during the last 9 months of 1948. With few exceptions, all recruits were tested within 4 days after reporting for active duty from civilian life (the freshman class at the U. S. Naval Academy was also included in the testing).

The tuberculin used for testing was the purified test material prepared in tablet form. The material was prepared in sufficient material for

tests. Measured amounts of sterile distilled water were provided in ampules, so that when one tablet was dissolved in an ampule, the resulting solution contained 0.0001 mg. of tuberculin per 0.1 cc. The test was performed by injecting 0.1 cc. of the tuberculin solution intradermally into the volar surface of the forearm. The test was interpreted 48 to 72 hours after injection of the antigen. The result was recorded as negative if there was no edema at the sight of injection even if redness was present. A doubtful reaction was one of slight redness and a trace of edema measuring 5 mm. or less in diameter. A positive test was one in which redness and definite edema were present and measured more than 5 mm. in diameter. The degree of reactivity, as determined by the diameter of induration, was recorded as follows:

- + more than 0.5 cm., but not exceeding 1 cm.
- + + more than 1 cm., but not exceeding 2 cm.
- + + + more than 2 cm.
- + + + + redness and edema plus an area of necrosis.

The results of tuberculin testing are shown in table 1. Of the 79,293 tuberculin tests performed, 7,675 or 9.7 percent were positive. Although the difference in the percentage of reactors between any 2 of

## NAVAL RECRUITING AREAS

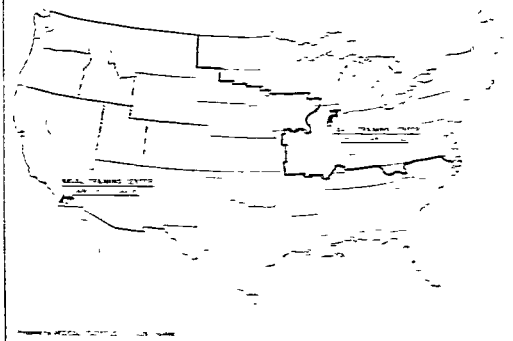


Figure 1.

the  $\pm$  activities is small, there is a statistically significant difference between the percentage of positive reactions reported at the Great Lakes Naval Training Center and that reported at the San Diego Naval Training Center. Figure 1 shows the geographical areas of place of enlistment for the recruits received at the training centers, Great Lakes, Ill., and San Diego, Calif. The slightly higher incidence of reactors found in recruits at San Diego may be due to the fact that many come from the Southern States where the incidence of tuberculous infection is somewhat greater. The degree of the reactions is shown in table 2.

TABLE 2.—Results of tuberculin tests in recruits and draftees, Army and Marine Corps, 1941.

Location	Number tested	Reactions			
		Positive	Partial	Indeterminate	Strongly positive
Total	1,000	100	100	100	100
Naval Training Center, Great Lakes, Ill.	100	10	10	10	10
Naval Training Center, San Diego, Calif.	100	10	10	10	10
Marine Corps Recruit Depot, Parris, Ga.	100	10	10	10	10
U. S. Navy Academy, Annapolis, Md.	100	10	10	10	10

Values are 2 SDs approximately.

TABLE 2—*Reactions to 0.0001 mg PPD tuberculin*

Reaction	Number	Percent	Reaction	Number	Percent
Total	79,303	100.0	++	3,199	4.0
Negative	70,872	89.3	++	2,470	3.1
Doubtful	844	1.1	+++	1,541	1.9
			++++	467	.6

Table 3 shows the age distribution of the Navy and Marine Corps recruits enlisted during the calendar year 1948 and the midshipmen of the class tested. It will be noted that 72 percent of the Navy recruits and 88 percent of the Marine Corps recruits fall into the age groups 17, 18, and 19. The majority of the Navy recruits were 18 and 19 years of age. A correlation was made of the percentage of reactors in the various age groups for 10,000 Navy recruits. No significant difference was found in the percentage of positive reactors in any of the age groups reported.

TABLE 3—*Percentage age distribution of Navy and Marine recruits, 1948, and midshipmen, class of 1951<sup>1</sup>*

Age (years)	Navy recruits	Marine recruits <sup>2</sup>	Midshipmen	Age (years)	Navy recruits	Marine recruits <sup>2</sup>	Midshipmen
Total	100.0	100.0	100.0	21	4.2	2.0	8.2
17	13.8	28.1	0.0	22	4.1	1.2	3.3
18	33.7	37.2	14.0	23	3.2	.6	1.2
19	25.0	22.5	35.3	24	1.8	.4	.1
20	9.9	7.2	37.7	25 or over	3.9	.7	.1

<sup>1</sup> From "Statistics of Military Personnel, Navy and Marine Corps," 1948.

<sup>2</sup> Marine recruits enlisted July-December 1948.

It should be pointed out that Navy and Marine Corps recruits are not representative of the general population because of factors other than the restricted age groups. For example, men with obvious physical defects, including tuberculosis, either do not apply for enlistment or they are disqualified by physical examination at the recruiting station and do not reach the training center. The percentage of Negro recruits is less than 3 percent and somewhat lower than that found in the general population of the United States. Men with delinquent or criminal records are barred from enlistment. Since enlistments during 1948 were voluntary, the young men who were inspired to obtain a college education are not represented.

Do the results of tuberculin testing as presented indicate that at least 90 percent of the young men enlisting in the Navy and Marine Corps have not been infected with *Mycobacterium tuberculosis*? This question certainly cannot be answered with an unqualified "yes," although there is fairly good support for an affirmative answer. In evaluating the tu-

tuberculin test there are many factors that must be considered. First are the factors that bring about a false negative test. It is known that the degree of hypersensitivity or allergy wanes with the years and that after an innocuous first infection a person may show a degree of allergy so slight that it will not be detected by the ordinary doses of antigen used in testing. The age of the recruits here reported reduces the chance for this possibility. There are other conditions which depress tuberculin allergy but fortunately these, such as fever, the exanthemas, and overwhelming tuberculous infection, are infrequent in occurrence and obvious when present.

There is good evidence to substantiate the statement that false positive reactions occur when the dosage of tuberculin is sufficiently great. Furcolow et al. (1), in titration studies of tuberculin, found that a dose of 0.0001 mg. PPD (the same as used in the study here reported) was sufficient to provoke a reaction of 5 or more millimeters of induration almost uniformly in those persons tested having known tuberculosis, and in a high proportion of those giving a history of contact with tuberculosis. This dose, on the other hand produced relatively few reactions among children considered free of the disease and without known exposure. However, when the dose of tuberculin was successively increased, almost all the persons tested eventually reacted to the antigen, including infants and young children without evidence of tuberculous infection or history of contact. It is improbable that such a high proportion of children were actually infected with tuberculosis. The explanation advanced by the authors is that, with the use of higher doses of the antigen, nonspecific reactions appear with increasing frequency. Palmer and Petersen (2) state that infections with other acid-fast bacilli, nonpathogenic for man, may result in a state of hypersensitivity which is detectable by tuberculin when high doses are used in testing.

The "first" and "second" strengths of PPD tuberculin are commonly employed in this country in performing the intradermal (Mantoux) test. The "second" strength (0.005 mg. per dose) is 250 times as strong as the "first" strength (0.00002 mg. per dose) and 50 times as strong as the "intermediate" strength (0.0001 mg. per dose) used in the mass survey of Navy and Marine recruits. It was decided to retest a sample of the nonreactors and a sample of the doubtful reactors using the "second" strength tuberculin.<sup>3</sup> The samples were picked at random and without knowledge of the roentgenographic findings. As shown in table 4, 63 percent of a group of 450 non-reactors to the 0.0001 mg. dose gave a positive reaction when retested with the 0.005 mg. dose. A group of 50 doubtful reactors to the

<sup>3</sup> PPD-S supplied by Field Studies Branch, Division of Tuberculosis, U. S. P. H. S.



# Motion Sickness

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**M**OTION sickness is that disability produced by acceleration and deceleration or rotation in any plane. The abnormal motions produced by trains, automobiles, and aircraft are usually less in degree or continuity than those produced by ships so that seasickness is the most classical example of motion sickness. Other examples of motion sickness are elevator sickness, swing sickness, and the vertigo produced by whirling as in some forms of dancing and skating. The vehicle or mechanism producing changes in acceleration is unimportant.

The sense of equilibrium is not a single sense as, for example, hearing is the sense of the cochlea; it is the function of several organs, the most important of which are the labyrinth, the proprioceptive sense, and vision. Fish are suspended in water which uniformly distributes its pressure on their external surfaces. They depend mainly on the labyrinth to determine their relationship with the force of gravity; of course, the labyrinth is well developed in these aquatic animals.

In terrestrial animals contact with gravity is made through only a small portion of the body surface, i. e. the feet, the supporting force of air being negligible. To maintain equilibrium, it is important that the proprioceptive sense be well-developed and such is the case. Birds, while flying, develop forces which counteract gravity so that mere equilibrium is not sufficient; orientation or reference to distant as well as proximate and internal environment is necessary. This is supplied mainly by vision. Man, without instruments, cannot fly without visual contact with the earth.

Many theories on various causes of motion sickness have been advanced, but the most popular are the labyrinthine and proprioceptive theories. The former contends that continuous stimulation of the vestibular apparatus by movements causes reflex nausea similar to

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that produced by the caloric or rotation tests. Strong support for this theory is the experiment that bilateral labyrinthectomy in four susceptible dogs rendered them nonsusceptible to motion sickness. On the other hand, no positive correlation between caloric tests and susceptibility to motion sickness could be demonstrated (1).

Vertigo and nystagmus which is characteristic of stimulation of the semicircular canals is not a characteristic symptom of seasickness. Advocates of the vestibular theory state that the symptoms are not primarily due to stimulation of the semicircular canals but to the utricle and perhaps saccule which record vertical movements and motion of translation respectively. In this connection it is interesting to note that ascent is usually the motion least tolerated. This motion is recorded in the utricle. Pitching, rolling, and yawing, in the order named, are usually the most offensive.

Another explanation suggested for the maximal effect of vertical movements is the change in filling of the large vessels of the head and neck, thus stimulating the carotid sinus with resultant changes in the autonomic nervous system (2). There is no experimental evidence to substantiate this theory.

Proprioceptive sense is mediated through the afferent impulses normally arising in muscles, tendons, and joints. Normally the body maintains its equilibrium largely by unconscious reflex action initiated by these afferent impulses plus those from the labyrinth. In tabes dorsalis these somatic impulses from the lower extremities may be abolished by disease of the columns of Goll and Burdach. Vision helps compensate for this loss, but the patient falls when in the dark or when blindfolded. Deaf-mutes in whom the labyrinth is absent, have no difficulty in maintaining their equilibrium when blindfolded. These facts have been cited to indicate that the proprioceptive sense is more important in equilibration and, therefore, in the causation of seasickness. It is a well-known fact that on lying down the symptoms of seasickness are ameliorated. This probably occurs because of the elimination of the stimuli from the righting reflexes originating in the skeletal system in the erect posture.

Relief by wearing a tight binder to minimize visceral movements has been reported. In running and other gymnastics, nausea and vomiting do not occur yet the visceral movement is certainly greater than that incident to the comparatively gentle roll and pitch of a vessel at sea. Young healthy recruits are as susceptible to seasickness as older viscerotropic persons in whom greater visceral movements should theoretically cause greater stimulation. These facts tend to discredit the visceral theory; in fact, objections can be found to any theory which incriminates a single organ or system.

Visual impressions are most important in orientation and equilibrium. Many people become nauseated when objects are passed rapidly before their eyes; discrepancy between the visual sense of motion and the proprioceptive and labyrinthine sense of stability probably accounts for the vertigo. Skaters and dancers by fixing their vision on a stationary object for a moment during each revolution neutralize the disorientation produced by spinning. Another method of avoiding symptoms is to snap the head in a direction opposite to that of the spin. This neutralizes the excessive labyrinthine stimulation produced by spinning. Suturing the eyelids or fixing the animal in plaster casts reduces an animal's susceptibility to motion sickness.

Strong or offensive odors such as exhaust gas, tobacco smoke, and cooking odors may precipitate symptoms.

It thus becomes apparent that motion sickness is not the result of stimulation of a single organ. It is the result of a break in accommodation by the spinal and medullary centers from continual unusual stimuli arising in many organs. In the order of importance, the senses are probably vestibular, proprioceptive, visual, and then the others. An important factor in this breakdown is a discrepancy in the sensations from various senses. Sensations from the labyrinth, somatic, or other senses are not unpleasant per se; it is the abnormal reflexes produced by these sensations that are unpleasant. Stimuli from various organs normally cause automatic and usually unconscious adjustments of the body to changes in its relation to the force of gravity. These sensations are correlated and integrated in cerebellar, medullary, and spinal centers. When these centers are repeatedly subjected to unusual stimuli, particularly when the stimuli are inconsistent, a point is finally reached when they cause more than the proper reflexes. A spill-over to other medullary and higher centers occurs, thus producing the symptoms of motion sickness. The break in accommodation may be quite sudden. In the midst of a conversation, the victim may be suddenly overwhelmed by nausea and vomiting. Just as accommodation can be broken, it can be acquired or regained. When this occurs on board ship the passenger is said to have acquired his "sea legs." This desirable state occurs when the spinal and medullary centers compensate for the motion of the ship and impulses no longer spill over to other centers. After a prolonged voyage, this adjustment to a periodically heaving deck may become so habitual that it continues when the passenger lands and the ataxia produced ashore has been referred to as "land sickness."

The symptoms of any organic disease are largely influenced by psychic factors and this is particularly true of *mal de mer*. These psychic factors are so commonly found that the entire symptom-complex is sometimes erroneously called functional. The fact that ani-

imals, including trained seals, and even fish, have been reliably reported seasick should be sufficient to refute this theory. Individual susceptibility to seasickness varies greatly. Some persons claim that they are never seasick; as a rule they are phlegmatic.

The nausea which affects a student aviator on making preparation for a hop, or the ship's passenger before the ship leaves the dock, is purely functional and should not be designated air or seasickness. It is probably a conditioned reflex based on association with previous experience and fear. The ease with which nausea and vomiting can often be precipitated by suggestion in a passenger already experiencing symptoms, is another example of the psychic influence.

In addition to simple conditioned reflexes there is also the complex effect of mental attitudes including memory, association, and fear. In airsickness, especially, the unsatisfactory rationalization of fear is a great factor. Whenever sea legs are lost without a distinct change in the periodicity of the ship's movements or when airsickness occurs in an experienced pilot who is not subject to airsickness, the cause is usually psychogenic. Most persons adjust well to the usual motion encountered at sea but an adjustment to a certain type does not prevent symptoms from developing when the motion changes its periodicity or becomes much greater. This type of seasickness should not be considered psychogenic. A person who rides comfortably on a battleship or ocean liner may be completely incapacitated on a destroyer or seagoing tug. Some individuals always remain susceptible and are miserable whenever they go to sea. Naval personnel have a small percentage of such cases even among old salts. Lord Nelson of Trafalgar fame was a victim of seasickness during his entire naval career.

In an analysis of unusually susceptible persons, 66 percent were found to have neurotic tendencies as compared with 23 percent in persons less susceptible to motion (3). That seasickness is often used as an escape mechanism is not doubted. The lethargy and mild depression produced by incipient motion sickness may justify an avoidance of responsibility or inadequacy in performing duties. Intense interest, on the other hand, may hold symptoms in abeyance. An emergency requiring action may dissipate the symptoms of motion sickness and, in general, persons who perform necessary or purposeful activity acquire "sea legs" much sooner than those who remain idle.

The symptoms of seasickness vary. The mildest consist merely of a slight depression, aversion to tobacco, food, and odors, and a dull occipital headache. There may be increased awareness of the epigastrium and increased yawning. Increased salivation and nausea are premonitory symptoms before the characteristic vomiting which is of the projectile central type. Pallor and cold sweating are usually present. Retching may continue spasmodically and is attributed to

spasmodic contraction of the diaphragm. The slow pulse and respiration, pallor and sweating, and subjective symptoms are similar to those produced by vagus stimulation as in excessive smoking. A sympathicotonic form characterized by restlessness, excitability, and insomnia has also been described. The facial expression of great dejection accurately records the patient's sensations.

Tests made on seasick patients showed an increase in blood sugar, a decrease in phosphorus, and a normal electro-encephalogram; no correlation was observed between instability and susceptibility. Electrocardiograms, blood pressure, and blood gas studies were also normal (1).

### TREATMENT

General hygienic measures a day or two before sailing with avoidance of last minute parties, bustle, and nervous tension are advantageous. The motion of the ship often produces insomnia in persons not seasick. In such cases a barbiturate such as nembutal is excellent. Since the multiplicity of new and unaccustomed stimuli has much to do with causing seasickness, steps to reduce his reaction to stimuli should be taken by the susceptible passenger. Lying down with the eyes closed or reclining in a deck chair facing away from the sea, will reduce both visual and skeletal reaction to stimulation. Good ventilation and absence of odors is of great help. Physical exertion tends to minimize the effect of the sea because of the purposeful motor activity. Walking and sports tend to reduce the tendency to lethargy when at sea. Reading is usually difficult and ambitious reading programs planned for a trip usually are never carried out. In the Navy, mild forms of seasickness are usually ignored and sea legs are acquired while the recruit busies himself with ship's work.

Atropine, hyoscine, and hyosecyamine have been prescribed because they inhibit the vagus or parasympathetic nerves. This seems rational because the symptoms are characteristic of overstimulation of the parasympathetic nerves. Undue hypnosis, dryness of the mouth, and other side effects are often noted with these drugs. The barbiturates, preferably one of the quick-acting ones as seconal or nembutal, are probably useful adjuncts in the early phases; besides alleviating apprehension and worry, they reduce the sensitivity of the medullary centers and so facilitate adjustment.

Until recently these methods were the best available. In November 1948, a clinical study of motion sickness was undertaken to determine the effectiveness of a new drug (dramamine) on seasickness (1). The effects of dramamine on personnel in each compartment of an army transport were observed and, as a result, the following conclusions were recorded: (a) When used prophylactically, 29 percent of those

treated by placebo were seasick as compared with 1.4 percent of those treated with dramamine. (b) All persons showing active symptoms of sickness were relieved by dramamine within half an hour. Side effects were minimal.

Dramamine is apparently a nontoxic, powerful, prophylactic, and therapeutic drug when used to control the symptoms of motion sickness.

We have used dramamine in the treatment of Ménière's disease with dramatic symptomatic relief of vertigo. Since May 1949 we have routinely used dramamine for the relief of postoperative vertigo following the fenestration operation. While nystagmus was usually unaffected, all other unpleasant symptoms such as vertigo, nausea, and vomiting were largely eliminated. The benadryl component of dramamine has an atropinelike action as well as anesthetic and mild hypnotic effects (5). Recent experiments indicate that dramamine affects the central nervous system above the level of the vestibular nuclei but not the labyrinth (6).

#### REFERENCES

1. McNALLY, W. J., and STUART, E. A.: Physiology of labyrinth reviewed in relation to seasickness and other forms of motion sickness. *War Med* 2: 683-771, Sept 1942.
2. POPPEN, J. R.: Seasickness, etiology and treatment. *U. S. Nav. M. Bull* 37: 463-469, July 1939.
3. SCHWAB, R. S.: Chronic seasickness; neurological, psychiatric and naval aspects. *U. S. Nav. M. Bull* 40: 923-936, Oct 1942.
4. GAY, L. N., and CARLINER, I. E.: Prevention and treatment of motion sickness; seasickness. *Bull. Johns Hopkins Hosp* 84: 470-490, May 1949.
5. HUNTER, R. B., and DUNLOP, D. M.: A Review of Antihistamine Drugs. *J. M. New Series* No. 68, Oct 1948.
6. SCHIFF, M., and HINWICH, H.: Correction of adverse turning syndrome with dramamine. To be published.



# Vagus Resection

## A Study of 19 Cases

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THERE has been so much controversy about vagus resection, with or without gastric drainage, that this article is written to present in detail the pre- and post-operative findings in 19 cases of vagus neurectomy.

There are two operative approaches to the vagus nerve, trans-abdominal and transthoracic; the individual case will determine the approach. In 18 cases, an abdominal approach through the left rectus muscle was used.

The only outstanding disadvantage of the transabdominal operation is that all the nerve trunks may not be severed. In one patient, there were two main nerves and one accessory. In all other patients, there were from two to five accessory or connecting nerve fibers which required excision. One worker reported that 8 percent of the nerve trunks are not definable infradiaphragmatically. The disadvantages following the transthoracic approach are: (a) the intra-abdominal lesion cannot be explored, (b) persistent postoperative thoracic pain may be present, (c) there is no opportunity to perform a concomitant intra-abdominal procedure, and (d) secondary surgical procedures may be necessary (13).

Vagus resection for the treatment of peptic ulcer has been studied by numerous investigators for many years. It was advocated by Stierlin in 1920. The stimulus for this research was originated by Pavlov in 1890, when he demonstrated that gastric function was influenced by the vagus nerve. This was later confirmed by other workers in the twentieth century (1).

Dragstedt (4) (5) (6) (7) stressed the use of vagus resection in cases of peptic ulcers with complication and those resistant to medical treatment, and especially emphasized the effect of the operation on the first period of gastric secretion—that of interdigestive or continuous secretion. It seems likely that certain aspects of the second period, digestive secretion, are favorably affected (2). This second

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or digestive period has been divided into the cephalic, gastric, and intestinal phases. The cephalic phase occurs when secretion and motility are influenced by mental stimuli; the gastric phase, when secretion and motility are stimulated by contact of gastric mucosa with secretagogues or food; and the intestinal phase, when chyme is being propelled and secretion enhanced by the presence of the bulk.

Vagus resection is of therapeutic value only if the operative procedure is complete, and if all the vagus fibers are severed as described by Weinstein et al. (3). Dragstedt (4) (5) (6) (7) was the first to report bilateral vagus resection.

Sham feeding and the use of insulin are the two methods for evaluating the completeness of vagus resection. Of these, the latter was considered the most practical in this study, since standard doses of regular insulin and accurate laboratory facilities were available. The effect of insulin hypoglycemia on the stomach has been studied thoroughly—it is thought to cause an increase in gastric motility (8) (9) (10) (11). The mechanism of action is considered to be a central vagal effect and there occurs an increase in gastric motility and secretion due to hypoglycemic stimulation of the vagus center (3) (12). Complete vagus resection abolishes these actions.

The relief of pain is not associated with evidence that pain pathways have been divided, as judged by postoperative balloon distention observations. Pain is still perceived in response to stimulation of the esophagus, duodenum, and jejunum, as shown by Moore et al. (14), and also when hydrochloric acid is introduced into the stomach, as shown by Dragstedt. It appears more probable that relief is due to decreased acidity or motility, or to both (2).

Merely because complete vagus resection is followed by immediate relief of pain, clinically, does not mean that excessive vagus stimulation is the cause of peptic ulcer. A patient may not be benefited by vagus resection, even though he is free from pain because vagal activity is not the pathogenic factor. A disorder such as aerophagia, masked gallbladder disease, or psychoneurosis may have been the basis of his syndrome. The vagus nerve is important in the interdigestive phase and in the gastric, cephalic, and intestinal phases of the digestive period.

A review of the literature on vagus resection in the treatment of peptic ulcer indicates that there are four questions to which answers should be obtained in order that physicians may evaluate this procedure. These questions are: (a) Are patients with peptic ulcer clinically benefited by the operation, and if so, what are the indications, contra-indications, and complications? (b) What demonstrable physiologic gastrointestinal changes are produced by resec-

tion of the vagus nerve? (c) How long do these physiologic changes persist? (d) How long do patients remain well from a clinical and roentgenologic standpoint (14)?

No treatment of peptic ulcer can be fully evaluated until it has been in use for a period of from 15 to 25 years.

### CASE REPORTS

*Case 1.*—Three years before admission this 36-year-old man noted epigastric pain and dyspepsia. A duodenal ulcer was demonstrated by roentgenogram. An ulcer regimen was instituted with regression of symptoms on two subsequent occasions; finally intractable pain developed. At operation an ulcer was seen in the first portion of the duodenum; vagus resection was performed.

Convalescence was uncomplicated except for persistence of three to four watery stools daily, beginning 1 month following discharge from the hospital. Five months later a gastroenterostomy was performed but the diarrheal symptoms continued for 7 more months until, under psychotherapy at a foreign base hospital, the patient was readjusted. Following this, he remained asymptomatic. A gastrointestinal series 3 weeks, 9 months, and again 16 months after operation, failed to show any ulcer. The results in this case were satisfactory, after the gastroenterostomy and psychotherapy.

*Case 2.*—This 40-year-old man had had a duodenal ulcer for 4 years; characteristic epigastric ulcer pain had been relieved by food. Two massive hemorrhages had previously occurred 2 years apart. Gastrointestinal series revealed a small ulcer on the lesser curvature of the pyloroduodenal junction. No gastric retention was present. After 1 month of medical treatment without improvement a vagus resection was performed. No other procedure was considered necessary since the pylorus was sufficiently patent.

The postoperative course was uncomplicated, and recovery uneventful.

Eighteen months after vagus neurectomy this patient was working daily and was asymptomatic except for occasional mild gaseous distention.

*Case 3.*—For 2 years before admission to the hospital, this 38-year-old man had been having mild epigastric pain. He had received no treatment. Four months after the onset of his pain, hematemesis and several tarry stools occurred, followed by severe epigastric pain which was unrelieved by food or antacids. On admission, roentgenographic studies showed a small ulcer niche on the inner aspect of the duodenum. Gastric emptying was normal. Intractable pain continued and after 3 weeks of medical care an exploratory laparotomy was performed. A nonobstructing ulcer on the anterior surface of the duodenum was seen and vagus neurectomy was performed. His convalescence was satisfactory. Roentgenogram 1 month postoperatively showed the duodenal ulcer to be healed; the patient had returned to work. Eighteen months after operation the patient had infrequent episodes of vomiting and gaseous distention.

*Case 4.*—In this 33-year-old man a duodenal ulcer was demonstrated roentgenologically 2½ years prior to admission. Following this he had two gastrointestinal hemorrhages, and 2 weeks before admission he had severe intractable epigastric pain accompanied once by hematemesis. He was not relieved after 3 weeks of medical treatment. Roentgenograms showed an ulcer in the first portion of the duodenum with scarring and no obstruction. A vagus resection was performed.



Convalescence was satisfactory. Roentgenogram 2 months following the operation showed no ulcer. Sixteen months later the patient was definitely improved; he was free from pain although he had postprandial eructation on rare occasions. Two years later, he had a recurrence of symptoms. Medical treatment for 6 weeks gave no relief. Another operation was performed and the ulcer was still present. Examination of the site of vagus resection revealed it to be incomplete, the left vagus nerve was intact. It was sectioned as usual and a partial gastrectomy performed. His symptoms were completely relieved, and have remained so.

*Case 5*—For 4 years this 47-year-old man had had a peptic ulcer. A bland diet and antacids were prescribed but epigastric pain accompanied by vomiting occurred occasionally. A roentgenogram showed a small niche along the greater curvature of the duodenal cap. After 2 weeks of medical treatment he still had intractable pain. No retention was present. At operation a duodenal ulcer was found on the first portion of the duodenum. A vagus resection was performed.

Fifteen months after operation he began vomiting and vomited about once every 2 or 3 months but he had no pain.

*Case 6*—An ulcer had been present in this 42-year-old man for 5 years. Treatment with a bland diet and antacids controlled the symptoms until 5 weeks before admission when intractable pain accompanied by vomiting occurred. One massive gastrointestinal hemorrhage had occurred 2 years previously.

Roentgenogram showed an ulcer in the greater curvature of the base of the duodenal cap. No obstruction. The condition failed to respond after 1 month of medical treatment. At operation the ulcer was identified and a vagus resection performed. The postoperative course was uncomplicated.

Fourteen months postoperatively he began to have daily vomiting and persistent moderate gaseous distention. A bland diet was continued. Nine months after operation some vertigo was present and he fainted three times during the summer months. Fainting did not occur in the 4 months following the summer episodes. During these episodes he found that eating sugar and honey prevented fainting.

His postoperative condition was not considered satisfactory. Perhaps a concomitant gastroenterostomy would have been of benefit.

*Case 7*—This 35-year-old man gave a history of duodenal ulcer and of episodes of diarrhea and melena for 17 years. A posterior contraperistaltic gastroenterostomy was performed at this hospital 2 years earlier. The patient on readmission complained of intractable epigastric pain. At operation a marginal ulcer and a fistula between the gallbladder and first portion of the duodenum were found. A vagus resection was performed. One month later a cholecystectomy was performed.

The postoperative course was uneventful. He returned to work 2 months after operation; his only complaint was occasional gaseous distention.

*Case 8*—Four years before admission to this hospital, a diagnosis of peptic ulcer was made in this 27-year-old man. During the following period he had one severe hemorrhage. Medical treatment gave him no relief from epigastric pain and dyspepsia. A gastric resection and anterior contraperistaltic gastrojejunostomy were performed. Following this he gained 34 pounds but 1 year later he had to return to the hospital because of severe intractable epigastric

pain which did not respond to treatment. At operation a marginal ulcer was found and a vagus neurectomy was performed.

Convalescence was uneventful. Three weeks later no ulcer was demonstrated on roentgenographic examination. Eighteen months following vagus resection he was free from pain and only had vomiting when emotionally upset.

*Case 9.*—Six years prior to admission this 52-year-old man had had a gastroenterostomy at a civilian hospital. He remained asymptomatic for 3 years. In the next 3 years two episodes of severe gastrointestinal hemorrhage occurred. In the past year although the epigastric pain was relieved by food and antacids, there was a weight loss of 10 pounds in 3 months. Gastrointestinal series showed an ulcer of the duodenal cap and some obstruction at the pylorus and a normally functioning posterior gastroenterostomy. After 3 weeks of medical treatment an operation was performed. A marginal ulcer was found and a vagus resection was performed.

The postoperative course was uneventful. Roentgenograms 3 weeks following operation revealed no ulcer.

Seventeen months following vagus resection, the patient complained of nausea and vomiting two to three times a week and also had a moderate amount of gas postprandially. He had no pain. He took a regular diet. Physical examination showed no abnormality and therefore it was considered that his complaints were psychosomatic in origin.

*Case 10.*—This 47-year-old man, during a 9-year period before admission, had had two massive hemorrhages and a gastroenterostomy that was performed 8 years earlier. He was asymptomatic until 1 month before admission, since then burning epigastric pain, lasting 15 to 20 minutes, occurred one-half hour following meals. He had lost 12 pounds of weight. One day previous to admission, a massive gastrointestinal hemorrhage occurred and continued for 3 days. Three weeks later, a roentgenogram showed a functioning posterior gastrojejunostomy with evidence of marginal irritability. There was a partial obstruction at the pylorus and an ulcer crater on the lesser curvature of the stomach. After 1 month of treatment epigastric distress was still present. An operation revealed a cicatrizing ulcer on the first portion of the duodenum. A vagus resection was performed.

His convalescence was satisfactory. Roentgenograms made 3 weeks and again 2 months following vagus resection showed no ulcer. Seventeen months after operation the patient was much improved. Constipation which was present before the operation was relieved. He had three episodes of 8 to 9 watery stools per day for 4 days—2 weeks, 1 month, and 15 months after operation. By eating 4 or 5 small meals daily he gained 10 pounds in weight.

*Case 11.*—Nine years previous to admission this 52-year-old man completely recovered from tuberculous epididymitis which was treated with drainage. Seven years before admission, he had a cholecystectomy, and 6½ years prior to admission he had a partial gastrectomy for duodenal ulcer.

His complaints on admission were compatible with marginal ulcer and this was demonstrated by roentgenogram. Medical treatment failed to relieve his symptoms. A transthoracic vagus resection was performed and this was followed by complete relief of symptoms for 13 months.

Two months postoperatively the patient sustained a spontaneous compression fracture of the second and third lumbar vertebrae, and 4 months later he had a spontaneous fracture of the spinous process of the right scapula. On two occasions the serum calcium was 15 mg. per 100 cc. and the serum phosphorus

9 mg per 100 cc. The basal metabolism rate was +23, +33, and +28. Multiple myeloma, Cushing's disease, and hyperparathyroidism were ruled out. Whether the vagus resection was responsible for this condition or whether its occurrence 2 months after vagus resection was coincidental is not known.

**Case 12**—Fourteen years previous to admission this 37-year-old man had a peptic ulcer which was demonstrated by roentgenogram. Eight months prior to admission a partial gastric resection was performed at another institution. He remained asymptomatic for 4 months when burning epigastric pain occurred, this finally became intractable. At operation a marginal ulcer was found and a vagus resection was performed. Convalescence was uneventful. Twelve months postoperatively the patient had no vomiting and only had occasional mild gaseous distention.

**Case 13**—For 28 years prior to admission this 34-year-old man had had symptoms of peptic ulcer for which 16 years prior to admission, a partial gastrectomy and gastroenterostomy were performed. He was admitted with a jejunocolic fistula. A resection of the jejunum, repair of the transverse colon, partial gastrectomy, and a new anterior contraperistaltic gastrojejunostomy were performed. Three months later, the patient was readmitted because of intractable pain, on gastrointestinal series extreme tenderness was found at the site of the new stoma. At operation, a jejunal marginal ulcer was found and a vagus resection was performed.

The postoperative course was uncomplicated. Three months later the patient was asymptomatic except for occasional slight gaseous distention following meals.

**Case 14**—This 31-year-old man had symptoms of peptic ulcer for 3 years. Repair of a perforated peptic ulcer had been performed 2 years after the onset of his symptoms. Following this he had intractable epigastric pain. Hospitalization and appropriate treatment failed to give him relief. The pain became constant, dull, and gnawing in character. Tarry stools occurred on several occasions. A gastrointestinal series showed a duodenal ulcer.

At operation one old healed, and one active duodenal ulcer were found. A gastrojejunostomy (posterior isoperistaltic) and vagus neurectomy were performed.

A gastrointestinal series 4 weeks later showed a healed ulcer of the duodenum. The patient's condition 20 months after operation was poor because of the persistence of frequent episodes of vomiting and gaseous distention. It is believed that this patient required psychotherapy for readjustment since many of his complaints were not consistent with the physical findings.

**Case 15**—This 67-year-old man had had intermittent "dragging" pain in the right upper quadrant of the abdomen associated with "gas" and eructation for 15 years before admission. During this entire period he had been on an ulcer regimen. The pain gradually increased in severity but was usually relieved by food and antacids. He had had three episodes of severe hematemesis during this period.

Roentgenologically, a gastric ulcer on the lesser curvature of the stomach was found. Gastric emptying was normal. At operation, a vagus resection was performed. Three weeks postoperatively a roentgenogram showed no ulcer. Improvement was noted 3 months postoperatively and 10 months following operation he was free from pain, although vomiting occurred about once a week and mild gaseous distention was occasionally present in the afternoon. Two years postoperatively a laparotomy for duodenal diverticulum was performed. The ulcer was found to be completely healed.

*Case 16.*—Five years before admission, this 39-year-old man was discharged from the Army because of peptic ulcer; his pain was relieved when he adhered to treatment. His symptoms recurred 4 years after discharge and again 5 months later. Medical management and hospitalization for 1 month gave him no relief and a vagus resection and gastroenterostomy were performed. Convalescence was satisfactory, but 2 weeks postoperatively he had delusions and a diagnosis of schizophrenia was made.

Roentgenograms made 2 months and again 14 months postoperatively showed no ulcer. Sixteen months following operation the patient reported that he had one episode of vomiting monthly and had gaseous distention at infrequent intervals. He took a regular diet (except for pickles and onions).

*Case 17.*—For 9 years the patient, a 33-year-old man, had been taking a bland diet because of a peptic ulcer. Two episodes of severe hiccups developed during this period, the last one occurring at the time of his admission to this hospital. Medical treatment was instituted and continued for 6 months but he had no relief. A roentgenogram showed a scarring deformity in the duodenal cap. There was no obstruction. Operation revealed an old ulcer on the anterior portion of the duodenal cap and a traction diverticulum. A posterior gastrojejunostomy and vagus resection were performed and the diverticulum was freed from its adhesions.

A gastrointestinal series 3 weeks postoperatively showed no ulcer. Sixteen months postoperatively the patient was improved although he had vomiting and mild gaseous distention at infrequent intervals.

*Case 18.*—This 47-year-old man had symptoms of intermittent nausea, vomiting, and diarrhea for 1 month. A duodenal ulcer was found on roentgenogram. Medical treatment for 2 weeks failed to give him relief. At operation a large ulcer which perforated into the liver, and dense adhesions which caused a traction diverticulum of the duodenum were found. A gastroenterostomy, release of the traction diverticulum, and a vagus resection were performed. After 18 hours the patient suddenly died. At autopsy the cause of death was found to be pulmonary embolism.

*Case 19.*—Eight years before admission a diagnosis of duodenal ulcer was established in this 32-year-old man. His chief complaint was slight hematemesis on several occasions. He was admitted because of severe epigastric pain not associated with nausea and vomiting. Treatment for 3 weeks was unsuccessful. At operation a large ulcer crater was found in the duodenum. A vagus resection and posterior isoperistaltic gastroenterostomy were performed.

The postoperative course was uneventful. Two months later, roentgenograms revealed no ulcer. Three months postoperatively he had vomiting once or twice a week and gaseous distention in the morning after eating. Because of the repeated symptoms this patient is not considered to have been satisfactorily improved, even though he had no pain.

#### DISCUSSION

Of the 19 patients, 17 are living. A follow-up study for a period of 8 months to 2 years was done in 17. One died as a result of pulmonary embolism 18 hours following operation, and one died after an automobile accident. The actual mortality in this series is, therefore, 5.3 percent. Eighteen transabdominal resections and one transthoracic

vagus resection were performed. Fourteen, or 83 percent, showed satisfactory improvement in that they seldom had nausea or vomiting. All had complete relief from pain. An attempted explanation for the "failures" is offered. In a great number of these patients the complaints stemmed from psychosomatic impulses. To treat any patient with peptic ulcer, a full realization and understanding of their psychosomatic make-up, as well as a knowledge of the pathologic nature of the disease is indispensable.

*Group I (table 1)*—Six cases had vagus resection as the primary operation. These patients had fewer complications, a shorter duration of symptoms, and excellent results should have been obtained. Yet, two of the six required additional operation and one patient had a poor functional result.

TABLE 1—*Vagus resection without other operation*

Case number	Age (years)	Duration of symptoms preoperatively (years)	Previous operation	Indication	Postoperative result
1.	36	3	None	Pain	Poor, required further operation.
2.	40	4	do	Pain and bleeding	Good
3.	38	2	do	do	Do
4.	33	2½	do	Pain	Poor, required further operation
5.	47	4	do	do	Good
6.	42	5	do	Pain and bleeding	Poor

*Group II (table 2)*.—The next seven cases had had previous gastric operations and had developed marginal ulcers with pain and bleeding as the most common complaints. Vagus neurectomy was successful in six cases. The seventh case was improved. The last six cases had some form of gastric drainage in addition to vagus neurectomy. This proved more satisfactory as five of the six patients had a good result.

TABLE 2—*Marginal ulcer*

Case number	Age (years)	Previous gastroenterostomy (years)	Previous gastric resection	Indications	Post-operative result
7.	35	2		Marginal ulcer	Good
8.	27	—	1 year	do	Do
9.	52	6	—	do	Poor
10.	47	8	—	do	Good
11.	52	—	1½ years	do	Do
12.	37	—	8 months	do	Do
13.	54	—	16 years	do	Do

Group II includes those patients with marginal ulcer who have had previous gastric resection or gastroenterostomy. The symptoms were

intractable pain or bleeding or both. In this series of 7 patients, 6 (86 percent) were satisfactorily improved. The one who failed to improve had had a gastroenterostomy 6 years previously (case 9), and this patient required careful psychiatric readjustment. The average age in this group was 43 years.

*Group III (table 3).*—Group III includes those patients with intractable pain or bleeding, or both, and in whom either gastric resection or gastroenterostomy was performed at the time of vagus resection. In this series of 6 patients, 5 survived. One died with pulmonary embolism 18 hours postoperatively. Of the 5 who survived, 3, or 60 percent, had satisfactory improvement. The average age in this group was 41.

TABLE 3.—*Vagus resection combined with other surgical procedure*

Case number	Age (years)	Gastro-enterostomy	Gastric resection	Indications	Postoperative result
14 .....	31	Yes .....	No .....	Pain and bleeding	Poor
15 .....	65	No .....	Yes .....	do	Good
16 .....	39	Yes .....	No .....	Pain .....	Do
17 .....	33	Yes .....	No .....	do .....	Do
18 .....	47	Yes .....	No .....	do .....	Death (due to pulmonary embolism 18 hours postoperative)
19 .....	32	Yes .....	No .....	do .....	Poor.

Each patient had pre- and post-operative roentgenograms and the insulin-acidity test of Dragstedt. In all the cases complete vagus resection was performed as indicated by Dragstedt tests. The average preoperative Dragstedt tests were free HCl, 39°; total acid, 67°. Extreme high, 50° to 108° (in case 7). Extreme low, 20° to 30° (in case 9).

Postoperative Dragstedt tests average free HCl, 6°; total acid, 52°; extreme high, 20° to 110° (in case 7); extreme low 0° to 16° (in case 9).

Cases 7 and 10 are included in the improved group with their Dragstedt tests as follows: case 7, free HCl, 50°, total 108°; postoperative free HCl 20°, total 110°; case 10, free HCl 62°, total 78°; postoperative free HCl 34°, total 64°.

In the treatment for peptic ulcer the result as determined by the patient, in the final analysis, is the index of cure. Vagus resection, per se, is not a specific method for the treatment for the ulcer, and the interpretation of results by chemical analysis and by roentgenogram is not sufficient proof of the efficacy of the treatment. It is evident, however, that definite benefit has been obtained. There has been no recurrence of bleeding; pain has been relieved, and repeated periods of hospitalization have not been required.

Postoperative complications which occur are, gastric dilatation immediately postoperatively; diarrhea which occurs after convalescence; and pulmonary embolism which may occur after any surgical procedure. Of the three patients who had diarrhea, two were affected only intermittently every 1 to 2 months and were free from diarrhea 1 year prior to this report (cases 9 and 14). In one patient diarrhea persisted for 9 months until he was relieved by psychotherapy (case 3).

### SUMMARY

Nineteen case reports of vagus resection are presented. The postoperative period of observation which ranged from 8 to 24 months is too short, and the number of cases too few to draw any definite conclusions. However, vagus resection is of value in relieving the intractable pain in peptic ulcer patients. It appears to be a good operation when other types of surgery have failed. It is effective in most cases of marginal ulcer. If pyloric obstruction is present, some type of drainage should be utilized at the same time. Many patients with peptic ulcers have an underlying psychosomatic condition which will not be relieved by any type of operation.

### REFERENCES

1. SITIN, I. F., JR., and MEYER, K. A. Studies on vagotomy in treatment of peptic ulcer, use of insulin in testing for completeness of vagotomy. *Surg., Gynec. & Obst.* 86: 473-479, April 1948.
2. SMITHWICK, R. H. Medical progress, surgery of autonomic nervous system. *New England J. Med.* 236: 602-609, May 1, 1947.
3. WEINSTEIN, V. A., COLP, R., HOLLANDER, F., and JEMEEIN, E. E. Vagotomy in therapy of peptic ulcer. *Surg., Gynec. & Obst.* 79: 297-305, Sept. 1944.
4. DRAGSTEDT, L. R., and OWENS, F. M., JR. Supradiaphragmatic section of vagus nerves in treatment of duodenal ulcer. *Proc. Soc. Exper. Biol. & Med.* 53: 152-154, June 1943.
5. DRAGSTEDT, L. R., PALMER, W. L., SCHAFER, P. W., and HODGES, P. C. Supradiaphragmatic section of vagus nerves in treatment of duodenal and gastric ulcers. *Gastroenterology* 3: 450-462, Dec. 1944.
6. DRAGSTEDT, L. R., and SCHAFER, P. W. Removal of vagus innervation of stomach in gastroduodenal ulcer. *Surgery* 17: 742-749, May 1945.
7. DRAGSTEDT, L. R. Vagotomy for gastroduodenal ulcer. *Ann. Surg.* 122: 973-989, Dec. 1945.
8. BILATO, E., and CARLSON, A. J. *Am. J. Physiol.* 68: 148, 1924.
9. BILATO, E., and CARLSON, A. J. Contributions to physiology of stomach; influence of experimental changes in blood sugar level on gastric hunger contractions. *Am. J. Physiol.* 69: 107-115, June 1924.
10. DICKSON, W. H., and WILSON, M. J. Control of motility of human stomach by drugs and other means. *J. Pharm. & Exper. Therap.* 24: 33-51, Aug. 1924.
11. NACHELES, H., OLSON, W. H., and MORRIS, R. Depression of gastric motility by insulin. *Am. J. Digest. Dis.* 8: 270-273, July 1941.

12. JEMEEIN, E. E.; HOLLANDER, F.; and WEINSTEIN, V. A.: Comparison of insulin and food as stimuli for differentiation of vagal and nonvagal gastric pouches. *Gastroenterology* 1: 500-512, May 1943.
13. HANSEN, A. M.: *Ann. West. Med. & Surg.* 2: 249, June 1948.
14. MOORE, F. D.; CHAPMAN, W. P.; SCHULTZ, M. D., and JONES, C. M.: Resection of vagus nerves in peptic ulcer; physiologic effects and clinical results, with report of 2 years' experience. *J. A. M. A.* 133: 741-749, March 15, 1947.







# Army Field Surgeon, Specialist

ROBERT P. WILLIAMS, *Brigadier General, MC, U S A*<sup>1</sup>

IN THE next war we can be sure of two things. casualties will be produced on an unprecedented scale and there will be scant time to train medical officers after the war starts. Recognizing that all medical officers should have training in the care and handling of casualties in the field, Maj. Gen. Raymond W. Bliss, the Army Surgeon General, in the August 1950 issue of the *Armed Forces Medical Journal*, announced the plan for field training of medical officers. A new company officers' course, lasting about 4½ months, will begin in the fall of this year at the Medical Field Service School, Fort Sam Houston, Tex. Following this the students will continue for an additional 4½ months at the Army Medical Service Research and Graduate School in Washington, undergoing instruction in recent advances in field medicine which are applicable to war conditions. Graduates of the course may then be given 2 years of applicatory duty in which they will serve as unit surgeons or company or platoon commanders in medical battalions. Also, beginning in September 1950, the Medical Field Service School will offer an advanced course of about 9 months. This course is primarily for older officers who have been on professional duty. It may be followed by 2 years of duty as division or corps surgeon, or in the office of an army or theater surgeon, or in the Medical Section of the Office of the Chief of Army Field Forces.

All of this is definitely specialization. The specialty has been termed army field medicine and those who practice it could be known as army field surgeons. No special Military Occupational Specialty (MOS) has been assigned to it. The Medical Section of Army Field Forces and the Surgeon General's Office are now engaged in studying the criteria appropriate for such an MOS.

Many elements enter into the duties and responsibilities of the army field surgeon. First he must be qualified in two different professions: the medical and the military. To practice medicine in the field or in combat, he must not only be proficient in medicine and surgery but also he must be able to obtain results with the limited facilities available and under such adverse local conditions as excessive heat or cold.

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mud or dust. Although major surgery is not ordinarily attempted in the forward field installations, it sometimes becomes necessary and it is for such circumstances that the army field surgeon must be prepared. In addition to having a wide knowledge of the more common medical specialties, he must be trained in tropical medicine and in the recognition and treatment of conditions peculiar to his environment. As a staff officer he will advise his commanding officer on medical and sanitary matters. This will require a broad understanding of preventive medicine applied on the basis of familiarity with the organization, duties, and mission of the military unit. Finally, the army field surgeon in many instances is a commanding officer, responsible for the training, discipline, and morale of his medical unit. Although his command may be small, it calls for a high degree of leadership. Having trained his men in a variety of technical skills, he will find that many of them, such as company and men, litter bearers, and ambulance drivers, will be employed away from his immediate control. Often they will be busy while other members of the unit are resting. Their skill and morale must be such as to inspire confidence because the patients they handle when they are on their own must have respect for their judgment and believe that they are in proper medical hands.

It is proposed that the MOS for the army field surgeon be in grades A, B, C, and D as are the medical professional specialties. Details are now being worked out. Only the broad principles can be announced at this time.

For instance, Grade D might be awarded on satisfactory completion of the company officers' course at the Medical Field Service School followed by 2 years of applicatory duty with a field medical unit. Because most of these officers on attaining this specialty rating will be assigned next in Army hospitals or on residency training, they will retain the MOS as long as they are in company grades. On promotion to field grade, requalification by attending the advanced course at the Medical Field Service School and by 2 years applicatory duty will be required.

Higher classifications in this MOS would be reserved for officers who enter army field medicine as a career. Grade C might be awarded a medical officer holding a D rating who is also a graduate of the Infantry, Artillery, or Armored School and of the Command and General Staff College. Grade B would require a short course in preventive medicine at the Army Medical Service Research and Graduate School and also graduation from the Armed Forces Staff College. Grade A would be reserved for medical officer graduates of the Army War College. Each of these school courses must be followed by an applicatory tour of duty with a field unit or a refresher professional assignment in an Army hospital.

In the study of appropriate criteria for the various grades of the MOS for the army field surgeon, cognizance will be taken of the fact that some officers now beyond the age limit for several of the service schools, nevertheless have had field or combat experience which might be considered equivalent to such school courses.

The response thus far to the reopening of army field medicine as a field for both general training and specialization has been very encouraging. Many medical officers engaged in recent maneuvers have voiced interest in field work and have inquired particularly as to what provisions are being made for this specialty.





# The Clinical Use of Antibiotics

## II. Prophylaxis of Infections<sup>1</sup>

PERRIN H. LONG, *Colonel, MC, A. U. S.*<sup>2</sup>

**T**OO MUCH hope has been placed in the prophylactic use of the sulfonamides and antibiotics against infection. Although in many instances this hope has not been justified, medical and dental officers should take advantage of the known prophylactic uses of the antibiotics.

### CHOLERA

Experimental data<sup>3</sup> indicate that the administration of 2 to 4 grams of chloramphenicol a day might constitute effective prophylaxis against cholera. Such a regime could only be recommended for trial during an epidemic period, and in persons who were contacts of patients with cholera, or who through their occupation were exposed to infection. Such prophylaxis, if started, should be continued until the chance of contracting cholera is past.

### GNOCOCCAL INFECTIONS

The observations of Harry Eagle and his coworkers indicate that the oral administration of a single dose of 250,000 units of crystalline penicillin G within a few hours after a sexual exposure to gonococcal infection will prevent the occurrence of this disease in a high percent of instances. Certainly, the intramuscular administration of 300,000 units of procaine penicillin G in aqueous suspension is effective in preventing gonococcal infection.

### HEMOLYTIC STREPTOCOCCAL INFECTIONS

The experience during World War II clearly indicates that the use of sulfonamides for prophylaxis in the mass of hemolytic streptococcal

<sup>1</sup> The second of four articles on this subject. The first appeared in the August issue.

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<sup>3</sup> GARID, R. L.; SCHIFFMAN, A. S.; JACKSON, E. B.; MANNING, M. C.; and EASTON, H. C.: Chloramphenicol (chloromycetin) in experimental cholera infections. *J. Bact.* 57: 349-352, Mar 1949.

infections in man is unwise. Whenever this procedure was attempted on a large scale, it was followed by outbreaks of infection produced by strains of the hemolytic streptococci which were resistant to sulfonamides. While similar experiences in man were not obtained with penicillin, there is a likelihood that the same result might be obtained if the latter drug were used under similar conditions. The only time when it is feasible to attempt the prophylaxis of hemolytic streptococcal infections is in relatively small groups that are closed, such as in orphanages, hospitals, penitentiaries and aboard ship. If penicillin is used, give 100,000 units by mouth four times a day for 3 or 4 days. If penicillin is not available, one of the sulfonamides (preferably sulfadiazine or sulfamerazine) given in appropriate doses would probably prove successful. As with penicillin, the sulfonamide employed should be given over a period of 3 or 4 days. Recent experimental tests with aureomycin seem to indicate that this drug in doses of 1 to 2 grams a day can be used as a prophylactic agent against hemolytic streptococcal infections. Certainly, if experimental data can be carried over into the clinical field, it would appear that streptococci will not easily develop a high degree of resistance to the antibacterial effects of aureomycin.

#### MENINGOCOCCAL MENINGITIS

The prophylaxis of this disease in men may be effected by the administration of one of the diazines or penicillin. In adults, 2 grams, three times a day administered for 1 day to all persons exposed to infection will arrest an epidemic of meningitis. This effect will be maintained until invasive strains of the meningococci once more appear in the group that has been treated. There is little doubt that the administration of penicillin in doses of 250,000 units every 4 hours would accomplish the same purpose.

#### OPHTHALMIA NEONATORUM

Since in most States the Credé method for the prophylaxis of ophthalmia neonatorum is required by law, and any variation from this method is illegal, the use of penicillin for this purpose cannot be recommended. Also, the frequency with which sensitivity is produced by the use of penicillin in the conjunctival sacs makes this an undesirable method for the prophylaxis of gonococcal infection in the eye. If, however, the Credé method appears to have failed, then treat with crystalline penicillin G in doses of 5,000 units given intramuscularly at intervals of 3 hours. Frequently apply an ophthalmic ointment containing 100,000 units of crystalline penicillin G per gram to the conjunctivae. This will bring about a cure within 2 or 3 days.

## PUERPERAL SEPSIS

Unless otherwise contraindicated, every woman in prolonged or difficult labor should receive 0.5 gram of aureomycin by mouth at intervals of 6 hours during the period of labor and for 48 to 72 hours afterwards. If this antibiotic is not available, use procaine penicillin G with added crystalline penicillin G given intramuscularly in aqueous suspension at intervals of 12 hours during the period of difficult labor and for 24 to 48 hours afterwards.

## RHEUMATIC FEVER

The administration of 1 gram of sulfadiazine daily to children 3 to 12 years of age who have had one or more attacks of rheumatic fever, during the period in which they are exposed to hemolytic streptococcal infections (generally 15 September to 15 May) will protect most of them against a recurrence of the rheumatic infection. Penicillin by mouth will produce the same effect. If crystalline penicillin G is to be used, a suggested dosage would be 100,000 units four times a day by mouth for the first week of each month during the period in which the child is exposed to infection. The usual checks used in patients undergoing prolonged sulfonamide therapy should be observed.

## SUBACUTE BACTERIAL ENDOCARDITIS

*It is very important to place every person who has a quiescent rheumatic fever or an organic heart lesion on specific chemotherapeutic or antibiotic prophylaxis before performing operations in or about the mouth, throat, nose, or intestinal tract. This injunction includes the extraction of teeth. Use procaine penicillin G with crystalline penicillin G added. Give 2 hours before the operative procedure and repeat once or twice or more as conditions seem to indicate at intervals of 12 hours after the operation. Other preparations of penicillin may be used if the one recommended is not available. Lacking penicillin, use aureomycin in doses of 2 grams a day.*

## SURGICAL CONDITIONS

*Clean surgical operations.*—Although there are a certain number of surgical procedures that are known as "clean" and in which under normal conditions the incidence of postoperative infection is less than 10 percent, in certain special instances such as cataract extraction, corneal transplantation, and intraocular operations in which the conjunctivae are infected, postoperative infection is to be avoided at all costs. In such patients (if adults) give procaine penicillin G with crystalline penicillin G added in aqueous suspension intramuscularly 2 hours before operation and repeat at intervals of 12 hours for 4 doses



after the surgical procedure has been completed. Start 12 hours before the operation and continue for 48 to 72 hours afterward. Lacking penicillin, use aureomycin in doses of 2 grams a day, starting 24 hours before operation and continuing for at least 3 days afterward.

*Colonic operations.*—The oral administration of sulfonamides and/or antibiotics that are bacteriostatically active in the gastrointestinal tract may be used as a pre- and post-operative measure for decreasing infection incident to colonic operations. Originally sulfaguanidine was used for this purpose; later, sulfasuxidine or sulfathalidine was used. In the last few years a combination of sulfasuxidine and streptomycin by mouth, or aureomycin or chloramphenicol has replaced the use of the sulfonamides. The aim in this type of therapy is to so lower the bacterial content of fecal material in the colon that the risk incident to soiling the peritoneal cavity or the wound itself will be greatly lessened. It is difficult to say which is the method of choice for pre- and post-operative preparation of the bowel for surgical procedures. If a combination of sulfasuxidine and streptomycin is used, give 1 gram of sulfasuxidine every 4 hours and 1 gram of streptomycin every 6 hours by mouth for 4 days before the operation and then continue this regime for from 7 to 10 days post-operatively. If chloramphenicol is to be used, 1 gram four times a day over the same period could be used. With aureomycin the dose would be 0.5 to 0.75 gram four times a day.

*Pulmonary operations.*—In surgical procedures that are being performed in infected or potentially infected areas of the lung, it is a good plan to do everything possible to minimize the spread of infection prior to, during, and after operation. As pulmonary infections are generally caused by a mixture of gram-positive and gram-negative bacteria, the antibiotic of choice for the control of the infection would be aureomycin. It should be administered in the doses recommended for moderately ill patients for 4 days before the operation and postoperatively for 7 to 14 days, depending on the patient's general condition. Chloramphenicol, given in the doses recommended for moderately ill patients, may also be used to minimize the spread of infection incident to pulmonary operations. If these antibiotics are lacking, a combination of procaine penicillin G and streptomycin, both given intramuscularly, could be used.

*Established surgical infections.*—It is a good plan, if the surgical treatment of an established infection has been decided on, to administer a sulfonamide or antibiotic before and after operative procedures have been completed. This will frequently prevent the spread of the infection and will tend to insure a rapid and uneventful convalescence. The agent of choice should be the antibiotic that is known to be most effective against the infecting organism and safest

for the patient. If time permits, it should be administered for from 24 to 48 hours prior to operation, and then it should be continued for from 5 to 7 days (or longer if indicated) after the surgical procedure has been completed. The dosage of the agent usually should be based on those used for the treatment of moderately ill patients (or suitable variations of those schedules).

*Impending surgical infections.*—This is the term and conception which Col. E. D. Churchill, Surgical Consultant, Mediterranean Theater of Operations, U. S. Army, developed in respect to what was then termed "prophylaxis of wound infection" during World War II. All wounds that result from external violence are probably contaminated and/or potentially infected with micro-organisms. In the treatment of impending infection in wounds, the choice of the antibiotic should be made with special reference to the one that has the widest range of action against bacteria. At present this is aureomycin; hence it should be used in adults in doses of 0.5 gram four times a day in the treatment of impending surgical infections. Lacking aureomycin, use 300,000 units of procaine penicillin G with 100,000 units of crystalline penicillin G added, and give intramuscularly in watery suspension at intervals of 8 to 12 hours. Crystalline penicillin G or procaine penicillin G in vegetable oil with 2 percent aluminum monostearate added may also be used in the treatment of impending surgical infections.



## Uncommon Antibiotics

**DICTYMAROL** is derived from spoiled sweet clover. In addition to its effect on prothrombin, it is antibacterial for gram-positive bacteria and inhibits *Staphylococcus aureus*, *Staph. albus*, and *Staph. pyogenes* in a dilution of 1:50,000.

**PATULIN** is derived from *Penicillium patulum* and appears to have some effect against gram-positive and gram-negative bacteria commonly present in the nasopharynx. It is used in a solution of 1:10,000 as a topical application or as a nasal spray.

**TOMATIN** is obtained from the "Pan American" and "red currant" tomato plants. It is active against *Staphylococcus aureus* and *Bacillus subtilis* and is highly effective against certain human dermatomyces belonging to *Fungi imperfecti* such as *Trichophyton mentagrophytes*, *Epidermophyton floccosum*, and *Microporum audouinii*.

**PHYOCYANIN** is obtained from cultures of *Pseudomonas pyocyanea*. In a 1:5,000 dilution it inhibits the growth of pathogenic fungi such as *Achorion schenckii*, *Microporum gypseum*, *Trichophyton gypseum*, and *Candida albicans*.

**HEMIPHYOCYANIN** is obtained from cultures of *P. pyocyanea*. It is active in dilutions of from 1:20,000 to 1:60,000 against *Achorion schenckii*, and *Candida albicans*. However, from a clinical report by Hopkins et al., hemiphyocyanin appears to have no advantage over commonly used fungicides.

**SHREDDED CABBAGE** releases a substance bactericidal to *Bacillus coli* and, to some extent, to *Staphylococcus aureus*; Peders and Fisher reported this in 1944.

# Relation of Nitrate Nitrogen Concentration in Well Water to the Occurrence of Methemoglobinemia in Infants

KENNETH F. MAXCY, M. D.<sup>1</sup>

IN 1945 Comly (1) advanced the hypothesis that the so-called idiopathic methemoglobinemia<sup>2</sup> in infants may be caused by the ingestion of well water containing large amounts of nitrates. In the 4 years that have elapsed since the publication of Comly's article, this hypothesis has received much attention and the observations that have been made establish its validity. During this period, a large number of cases of methemoglobinemia in infants have been reported (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16). In every case the baby had been fed on an artificial formula made with cow's milk, condensed milk, or milk powder *diluted with well water*. None of the infants was breast-fed only. Usually the wells from which the water was obtained were dug rather than drilled, had inadequate casings or none at all, were unsatisfactory with regard to location and construction, and, in many instances, showed evidence of pollution. Where the well water was subjected to chemical analysis, with two or three questionable exceptions, it was found to have a high content of nitrate of nitrogen and occasional traces of nitrites.

In some cases it was observed that with temporary discontinuance of the formula, the cyanosis produced by the methemoglobinemia cleared up only to reappear when artificial feeding was resumed. When the formula was changed to one made up of water having low nitrate nitrogen content, the cyanosis disappeared. If untreated,

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<sup>2</sup> Methemoglobinemia designates the presence of methemoglobin in the blood. Some portion of the heme in the oxyhemoglobin molecule has been oxidized, ferrous ions being converted into ferric ions. Oxygen is so firmly bound that it cannot function in respiration. The color of the blood is changed from the normal deep red to a chocolate brown, giving a cyanotic tint to the skin. Methemoglobinemia may result from the ingestion and absorption of such drugs and chemicals as aniline, nitrobenzene compounds, acetanilid, sulfonamides, chlorates, and dimethyl sulfoxide.

of location and construction and showing no evidence of bacterial pollution, were found to have high nitrate content.

TABLE 2—Concentration of nitrate nitrogen in wells not implicated<sup>1</sup>

	Concentration of nitrate nitrogen in p. p. m.				
	0-9	10-20	21-50	51-100	Over 100
Dug wells:					
Schools ..	48	1	1	0	0
Farms .....	30	11	13	13	2
Drilled wells:					
Schools .....	77	0	0	0	0
Farms .....	51	9	4	0	0

<sup>1</sup> From reference 17

The cases of methemoglobinemia so far reported have a peculiar geographic distribution. They have originated in Iowa, Illinois, Minnesota, Nebraska, Missouri, Kansas, Michigan, Indiana, North Dakota, New York (two cases), Manitoba, Saskatchewan, and Ontario. The significance of this geographic concentration in the North Central United States and the central Provinces of Canada is not yet clear. The first question to be answered is whether this geographic concentration of cases is real or apparent. Physicians are not required to report methemoglobinemia to health authorities. Present-day knowledge of the occurrence of cases is derived from voluntary reports in journals and the published results of special inquiries undertaken in a few States, centering about Iowa, where the condition was originally described. It must be conceded, therefore, that the geographic limits of the occurrence of this condition have not yet been established by systematically collected information. Nevertheless, it seems unlikely that with the attention given this subject in medical journals, it would have escaped recognition in other parts of the United States and Canada. While the area from which cases of methemoglobinemia are reported may, in time, be enlarged, there is justification for the assumption that the geographic concentration of cases is a significant fact that requires explanation if intelligent preventive measures are to be taken.

One hypothesis is that it is directly related to the frequency with which infants are placed on artificial formulas made with well water in the first few months of life. While this frequency would undoubtedly vary in different parts of the country and with social, economic, and cultural backgrounds, the variation would hardly seem to be sufficient to play a major role in the geographic distribution of cases. A second hypothesis is that in this particular section of the country well waters with high nitrate count are more frequently encountered than in others.

The following summarizes our knowledge on this subject (28):

The ground waters of the United States contain varying amounts of nitrate derived from many sources. Among these are human and animal wastes and both organic and inorganic fertilizers. In some instances nitrogenous industrial wastes may give rise to high nitrate waters. However, ground waters may have a high nitrate content in areas where no such sources are present, or are present to an extent much too small to account for the large amount of nitrate. The source of nitrate in such cases has not been explained.

There are undoubtedly variations in the amount of nitrogenous material present at the surface or within a water-bearing formation and the rate at which it becomes available in the form of nitrate. The differences in the amount of nitrate from place to place are influenced by the rate of circulation of the water, the amount of recharge and location of recharge areas, the location of discharge areas, and the length of time that present conditions have existed.

The Geological Survey has made many thousands of chemical analyses of ground waters collected in all parts of the country during the past several decades. In general, natural waters do not contain more than 5 to 10 p. p. m. of nitrate. In a few areas in the United States nitrates in ground waters are found ranging up to 100 p. p. m. or even more. Such occurrences have been observed in Texas, Kansas, New Mexico, and in a number of our Western localities. Nitrate concentrations up to several hundred p. p. m. are not unusual in certain parts of Texas.

While only preliminary studies have been made of these data, it is apparent that the nitrate in ground water is not affected materially by rainfall or that the nitrate salts are being continuously replenished. There appears to be little relation between the occurrence of high nitrates in ground waters and the intensity of developments in the area. In Texas most of the waters containing high nitrate were obtained from wells less than 200 feet deep. We do not know definitely the relationship of high nitrate concentrations of ground waters to the geologic age of the water-bearing sands. Indications are that in Texas the formations of a younger age usually may be expected to yield a greater preponderance of high nitrate waters.

No map showing the location of these areas of high nitrate concentration in the United States has been compiled, but there is definite information that numerous rural private (household) wells in Texas yield water containing 22 to 133 p. p. m., and Oklahoma reported an average nitrate content of 28 p. p. m. for 415 wells with a maximum concentration of 638 p. p. m. (27). The experience of New York State (27) is reflected in the results of chemical examinations made from 1943 to 1946, inclusive, in connection with the supervision of public and private water supplies. In this period, 18,013 samples from ground water sources, wells, and springs were analyzed. Of these, 175 (all from private water supplies) had a concentration of 20 p. p. m. or more of nitrate nitrogen distributed as follows:

	Concentration of nitrate nitrogen p. p. m.			
	21-30	31-40	41-50	51-100
Number of samples	112	36	8	19

Although the proportion of such supplies is small (1 percent of the total) in comparison with the frequency reported in the North Central States, it is not negligible. As yet only one authenticated and one suspicious case of methemoglobinemia has been recognized in New York and none in Oklahoma or Texas. Such observations could be extended by reference to other reports.

A similar observation has been made with regard to public water supplies secured from wells and springs. Such supplies are carefully protected from pollution and in general rarely have more than 20 p. p. m. of nitrate nitrogen. Occasionally, however, supplies are encountered that have much higher concentration. For example, of 550 public ground-water supplies in Illinois only 2 were shown to have a nitrate nitrogen content greater than 45 p. p. m. (29). A 95-foot well at Hartsburg, Ill., was found to yield water of 123 p. p. m. nitrate nitrogen after 5 minutes of pumping. An 80-foot well at Mt. Pulaski, Ill., was found to contain 274 p. p. m. of nitrate nitrogen on one occasion and 83.5 on another. In neither instance was there evidence of pollution. The water at Mt. Pulaski had been in use for over 40 years.

It would be expected that, among populations of small towns and small cities served by such supplies, cases of methemoglobinemia would have been discovered and reported. As yet, however, no cases of methemoglobinemia have been reported from a public water supply secured from wells or springs. With regard to public water supplies obtained from surface streams, water containing more than 5 p. p. m. of nitrate nitrogen is rarely encountered. A recent review of the experience in New York State from 1943 to 1946 indicates that of 1,547 samples from surface supplies only 2 contained 10 to 15 p. p. m. of nitrate nitrogen (27).

There is, however, a possible hazard created through the discharge of industrial wastes. This is illustrated by the experience of Warren, Ohio (26). Since the war, several plants, built originally for the production of trinitrotoluene, have been converted into plants producing ammonium nitrate for use as fertilizer. Wherever such plants are situated there is a possibility of direct contamination of surface waters. While no cases of methemoglobinemia have as yet been traced to such sources the potential hazard exists and the health authorities should be alerted to it.<sup>3</sup>

<sup>3</sup> The following recommendations are made toward minimizing and controlling waste water from plants producing ammonium nitrate for use as fertilizer: (a) Allow the operation of such plants only in areas where there is practically no danger of water supply contamination by the plant wastes. (b) Increase plant house-keeping efficiency to the highest level consistent with economical plant operation. Attention should be given to the conservation of plant products. This conservation should be practiced to eliminate nitrate waste discharge rather than to recover its value. Through recent efforts of the Army

## SUMMARY

Water supplies derived from springs and wells, whether public or private, which have a high nitrate nitrogen content are distributed over a much wider geographic area than are the cases of methemoglobinemia as yet reported. So far the cases have been associated only with the use of water from private household supplies of well water. These observations lead logically to a question of the nature of the factor or factors that are required in addition to high nitrate content in the causation of this condition and that are peculiar to the geographic area of its occurrence. The hypothesis might be advanced, for example, that causation is not determined alone by the age of the infant, the quantity of water ingested, and the concentration of nitrate nitrogen of the water used for dilution of the formula, but that there is a difference between nitrate nitrogen derived from organic and inorganic sources, or that it is necessary to have present some additional factor or factors derived from biologic activities in the soil or in the well water to insure the breakdown of nitrates into nitrites after ingestion by the infant. These and similar questions cannot yet be answered. There is urgent need for further study before comprehensive preventive measures can be advocated. Such a study would be facilitated if it were organized on a basis that would permit observations in various parts of the United States by the same unit. This unit should consist of an epidemiologist, a pediatrician, a sanitary engineer, a biochemist, and a bacteriologist, with the needed laboratory facilities. The problem is of sufficient importance to justify the interest of the Federal Government.

## CONCLUSIONS

1. Further studies should be made of the relation of the nitrate nitrogen content of well waters to methemoglobinemia in infants.
2. Pending such studies, health authorities in the States and Provinces concerned should be advised that water from private household

## Footnote 3 continued

Industrial Hygiene Laboratory, the loss of material being processed from one such plant was reduced about 75 percent. This was accomplished by following good housekeeping techniques in handling the materials throughout the plant with increased respect from the standpoint of waste. (c) Maintain constant surveillance of such plants, their wastes and the effects of these wastes on surface and ground waters in the area through appropriate Federal and State agencies. Lagooning waste water from such plants is not an ultimate solution because of the danger of constant leaching of the nitrates into the soil and ground water. At present there appears to be no feasible treatment method for nitrate wastes. The only recognized possibility is the use of biologic ponds wherein the nitrates become food for plants that are in turn consumed by animal life. (d) Emphasize the importance of nitrite as well as nitrate nitrogen in these problems as the nitrite content may be responsible for methemoglobinemia. (R. E. Fuhrman is preparing these findings in connection with studies being made for the Committee on Sanitary Engineering and Environment, National Research Council.)





# Antibiotic Drugs in Venereal Disease Therapy

MICHAEL J. SCOTT, *Captain, MC, U S A.*<sup>1</sup>

**B**ECAUSE of the widespread use of antibiotic drugs, the number of patients sensitive to one or more of these agents is increasing. The desirability of having an alternative antibiotic drug for the sensitized patient is, therefore, becoming increasingly important. Although the optimum dosage and duration of therapy have not yet been standardized, numerous schedules with antibiotic drugs have been found to cure venereal diseases.

## GONORRHEA

The drugs of choice in the treatment of gonorrheal urethritis are penicillin, aureomycin, streptomycin, and the sulfonamides. The dosage and results of sulfonamide and penicillin therapy are well known and need not be discussed. Aureomycin hydrochloride given orally in doses of 1 to 3.5 gm. over a period of 12 to 36 hours is highly effective against acute gonorrheal urethritis. In a large series of cases (1) 92.6 percent of the patients were cured with a single course of treatment. The results are, therefore, inferior to those obtained with a single intramuscular dose of 300,000 units of crystalline penicillin in beeswax and peanut oil. In a small series of cases at this hospital we have not as yet encountered any failures in patients given a total of 3 gm. in doses of 0.5 to 1 gm. every 8 hours. The effects of aureomycin, given orally, on the clinical and bacteriologic findings are similar to those observed with penicillin although they occur more slowly. The urethral discharge generally becomes less profuse or ceases entirely within 24 hours. With this small dosage, toxic effects were not observed. Aureomycin is of value in patients sensitive to penicillin or in the so-called "penicillin-resistant" cases. Aureomycin in the dosage recommended, is also of value in treating gonorrheal urethritis in patients with coexisting syphilis. With the small dose cited, aureomycin did not affect the darkfield examination or the sero-

<sup>1</sup> 98th General Hospital, European Command U S Army.

logic tests for syphilis in contrast to the effects of penicillin in the treatment of gonorrhea. Streptomycin is also effective in the treatment of gonorrhea. In a large series of cases (2) a single intramuscular injection of 0.3 to 0.6 gm. of streptomycin in an aqueous solution resulted in the cure of 90 percent of the patients. Patients failing to respond to this initial injection were reported as being cured by a second treatment with a slightly larger amount of streptomycin. Since streptomycin in such small doses does not inhibit the activity of the spirochete, it does not prevent the appearance of the early clinical manifestations nor does it prolong the incubation period of syphilis, as is the case with penicillin. Preliminary reports indicate that chloramphenicol will be effective in gonorrheal urethritis.

### LYMPHOGRANULOMA VENEREUM

The drugs of choice in lymphogranuloma venereum are aureomycin (3) and the sulfonamides. Numerous dosage schedules, including 20 mg. of aureomycin given intramuscularly every day for 10 consecutive days, have proved effective. Because severe local pain and toxic reactions often occur at the site of the injection, it is more practical to prescribe 0.5 gm. orally every 8 hours until the condition is cured. The usual dose of sulfathiazole or sulfadiazine is 1 gm. four times a day for 10 to 21 days or until the lesions heal.

### CHANCROID

The drugs of choice in the treatment of chancroid are aureomycin, the sulfonamides, and streptomycin. At this hospital, using aureomycin in doses of 0.25 to 0.5 gm. every 8 hours until the lesions were completely healed, the stay in the hospital was shortened, compared to the hospitalization formerly required with sulfonamides. Toxic effects have seldom been observed and discontinuance of the drug for that reason is usually not necessary. Sulfathiazole or sulfadiazine, having the advantage of lower cost, are generally prescribed in doses of 1 gm. four times a day until the condition is cured (usually 7 to 21 days). Streptomycin, although effective (4), is no more so than sulfathiazole and has the disadvantage of intramuscular injection. Streptomycin would be indicated in sulfonamide-sensitive patients in whom coexisting lesions of syphilis are believed to be present. Aureomycin, administered in sufficient quantity to cure chancroid, may prevent the appearance of the early clinical manifestations of syphilis or prolong the incubation period. It is, therefore, advisable to follow all patients receiving aureomycin with monthly serologic tests for syphilis on completion of therapy.

## GRANULOMA INGUINALE

The drugs of choice in granuloma inguinale are chloromycetin, aureomycin, and streptomycin. Chloromycetin, administered orally in doses of 0.5 gm. every 6 hours for 10 to 15 days until 20 to 30 gm. have been given, has proved effective in treating this disease (5). Donovan bodies disappear more rapidly from the lesions than when streptomycin or aureomycin are used. Healing occurs before the therapy is completed or 2 to 3 weeks following completion of therapy. Resistance to chloromycetin has, in contrast to streptomycin, not been encountered. The toxic effects of chloromycetin have been negligible. Although the recommended dosage of streptomycin is 4 gm. a day given intramuscularly in divided doses for 5 consecutive days, the author believes that this dosage is too large and prefers to give 1 gm. a day in divided doses for 15 to 20 days. About 10 percent of all patients treated with streptomycin eventually have a relapse (6). A few streptomycin-resistant patients have been reported. Aureomycin has proved effective in these patients and in those who relapse following treatment with streptomycin (7). It has, however, the disadvantage of occasionally causing nausea, vomiting, and diarrhea because of the relatively large total dose required and because of the longer duration of therapy in this disease.

## SYPHILIS

The drugs of choice in the treatment of syphilis are penicillin and aureomycin. Two treatment schedules for the treatment of primary, secondary, and latent syphilis are recommended: (a) penicillin G in aqueous solution administered every 3 hours, night and day, for 8 consecutive days and using a total of 4,800,000 units; or (b) crystalline penicillin G in peanut oil and beeswax (or procaine penicillin in oil), given in 10 consecutive daily injections of 600,000 units each. At present the latter schedule is being used in the Army. The failure rate varies in different clinics, but is probably less than 10 percent when reinfections are considered. Treatment with penicillin alone in early syphilis is as satisfactory as when combined with arsenic and bismuth preparations. The recommended total dose in congenital syphilis varies between 100,000 and 400,000 units per kilogram of body weight, given in divided doses for 8 days. In the treatment of neurosyphilis a total of 9,000,000 to 15,000,000 units in divided doses for 15 to 21 days is recommended. This may be in either an aqueous solution or in a peanut oil and beeswax base. The Army prescribed 96 consecutive intramuscular injections of 100,000 units each of aqueous penicillin G, given every 3 hours for 12 days. Numerous experiments are in progress in which procaine penicillin in oil with aluminum mono-

stearate is being used. In one such experiment 1,200,000 units are being given in a single intramuscular dose for the treatment of primary and secondary syphilis. The results with this method have been promising.

Aureomycin, although not as effective as penicillin, has been used successfully in the treatment of syphilis (8) (9). Following either oral or intramuscular administration it is readily absorbed into the blood stream and is capable of diffusing through the placenta. Unlike penicillin, aureomycin has been demonstrated in the spinal fluid. The changes in the cerebrospinal fluid findings have been similar after either aureomycin or penicillin therapy. Herxheimer reactions are commonly noted in syphilitic patients receiving aureomycin and this phenomenon should be remembered whenever an unexplained rise in temperature occurs following the administration of aureomycin. The Herxheimer reaction may be observed 24 to 36 hours after initiating therapy. Aureomycin appears, therefore, to have the widest range of any known antibiotic drug in the treatment of venereal diseases.

#### REFERENCES

- 1 COLLINS, H. S., TROUSDALE, H., KAISER, T. I., IRGAN, P. C.; and FINLAND, M.: Aureomycin treatment of acute gonorrhea in males. *Am J Syph* 33: 263-269, May 1949.
- 2 TAGGART, S. R., HIRSH, H. L., HENDRICKS, F. D., GAMBE, G. R., PUZAK, M. A.; and GREAVES, A. B.: Treatment of gonorrhea with streptomycin. *Am J Syph* 33: 177-179, Mar 1949.
- 3 WRIGHT, L. T., SANDLES, M., LOGAN, M. A., PRIGOT, A., and HILL, L. M.: Aureomycin, new antibiotic with virucidal properties, preliminary report on successful treatment of 25 cases of lymphogranuloma venereum. *J A M A* 138: 408-412, Oct 9, 1948.
- 4 TAGGART, S. R., HIRSH, H. L., HENDRICKS, F. D., GAMBE, G. R., PUZAK, M. A.; and GREAVES, A. B.: Treatment of chancroid with streptomycin. *Am J Syph* 33: 180-181, Mar 1949.
- 5 GREENBLATT, R. B., WAMMOCK, V. S., DIENST, R. B., and WEST, R. M.: Chloromycetin in the therapy of granuloma inguinale. *J M A Georgia* 38: 206-208, May 1949.
- 6 GREENBLATT, R. B., DIENST, R. B., KUEFFERMAN, H. S., and REINSTEIN, C. R.: Granuloma inguinale; streptomycin therapy and research. *J Ven Dis Inform* 28: 182-188, Sept 1947.
- 7 GREENBLATT, R. B., DIENST, R. B., CHEN, C., and WEST, R. M.: Oral aureomycin in the therapy of streptomycin-resistant granuloma inguinale. *South M J* 41: 1121-1123, Dec 1948.
- 8 O'LEARY, P. A.; KIERLAND, R. R.; and HOFFMILL, W. D.: Oral administration of aureomycin and its effect on *Treponema pallidum* in man. *Proc Staff Meet Mayo Clin* 23: 574-578, Dec 8, 1948.
- 9 IRGAN, S., and ALEXANDER, E. R.: Treatment of early syphilis with aureomycin. *Harlem Hospital Bulletin* 1: 91, 1948.

# Early Detection of Carcinoma of Cervix Uteri

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THE cytologic study of smears of the cervix uteri for the detection of cancer has proved to be of undeniable value. The Departments of Pathology and of Gynecology, U. S. Naval Hospital, San Diego, Calif., have undertaken a joint study to evaluate the accuracy and practicability of the smear technique for cancer detection as advocated by Papanicolaou and Traut (1). This report is an evaluation of the results obtained with this technique in the detection of malignancy of the cervix uteri.

## MATERIALS AND METHODS

Preliminary tests were made in an attempt to evaluate various cell staining methods. The stains compared were the hematoxylin-eosin, Hortega's silver stain, and the Papanicolaou-Traut stain (1) (2). The technique of procuring the smear was standardized by utilizing the cervical surface method as described by Ayre (3) (4). This was modified in that a standard tongue blade was cut down to conform more readily to the cervical os; by rotary movement, the wooden blade procured cervical material. This was smeared on a slide and immediately immersed in a solution of equal parts of 95 percent ethanol and ethyl ether. After a minimum of 15 minutes of fixation, the slide was air dried and sent to the laboratory. Three slides were prepared for each case.

Smears of the first 200 cases were stained by the three staining methods referred to previously and examined for cytologic evidence of malignancy. Thus a comparative series of cases were studied for staining efficacy. It was found that the cells characteristic of cancer could be detected by Hortega's silver stain, "H and E," or Papanicolaou's method. However, the cellular detail was superior with the latter two stains. It was also noted that more information relative to hormonal effects on the desquamated cervical and vaginal epi-

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thelium was obtained with the Papanicolaou stain technique. Therefore, it was decided that the Papanicolaou method was the technique to be used in the remainder of the study.

Schiller's iodine tinctorial test of the cervix was used in the first 500 cases of the series and no correlation of this test and malignant areas of the cervix was found. This procedure was discontinued in the remainder of this project.

### FINDINGS AND RESULTS

To date, 1,500 smears have been studied and of these 29 showed cytologic evidence of carcinoma of the cervix. Twenty-two were confirmed by biopsy, and in 7 biopsy of the cervix was negative. Thus the percentage of confirmed positive reports was 1.5 percent and the percentage of false positive reports was 0.47 percent. Meigs et al. (5) reported a series of 1,015 cases, with carcinoma found in 154 cases and a false positive report of 8.1 percent. Kano (6) reported a series of 500 cases with 1.6 percent false positives. Kernodle et al. (7) reported 1,709 cases in which cancer was found in 124 and a false positive report of 8.1 percent. Thus the results at this hospital compare favorably with those reported in the literature. It must be pointed out, however, that in our series the 7 false positive cases were reported in the first 250 cases examined indicating that with increasing experience in interpretation of smears, the number of errors became smaller. The number of false negatives cannot be determined unless a specimen for biopsy is taken on all patients. It is evident that such a procedure in a large series is not feasible. No attempt to select patients was made; all patients that presented themselves at the outpatient department were given a "cancer" test.

Definitive therapy is dependent upon whether the cervical lesion is preinvasive or invasive carcinoma. This is determined by obtaining a 360° cone of the cervix by sharp dissection. The specimen is serially sectioned and the ecto-endocervical junction is especially examined since this is the critical area as the nidus of malignancy according to Foote and Stewart (8) and Pund and Auerbach (9). If the cone reveals the neoplasm to be preinvasive, a simple hysterectomy with resection of a wide vaginal cuff is done. The distal 2.5 cm. of the cervix uteri is serially sectioned to rule out invasive carcinoma. On the other hand, if the initial cervical cone reveals invasive carcinoma, radium and high-voltage roentgen therapy is instituted as outlined by Baker (10).

Smears of the cervix of patients being treated for invasive carcinoma are taken weekly to determine the radiosensitivity of the tumor. Radiation response can be made on histologic studies as reported by Frankl and Amreich (11), Arneson and Stewart (12),

Warren et al. (13), and Graham (14). If malignant cells are seen after being desquamated after 90 days, a specimen is taken and if the findings are confirmed, a modified Wertheim procedure is considered if the lesion is operable. However, if there are no malignant cells seen on the smear after 90 days following radium and high-voltage roentgen therapy, follow-up smears are done every 3 months. In the patients who had total hysterectomy, examination showed preinvasive carcinoma in 4 and no evidence of cancer in 3. In the latter, complete removal of the malignant tissue was obtained by a 260-day conization of the cervix. In this series, there were 18 with squamous cell carcinoma and 1 with adenocarcinoma of the cervix. There were no instances of endometrial carcinoma; this is not unusual when it is considered that 97 percent of the patients seen at this clinic are of premenopausal age. The average age of patients with cancer of the cervix is found in this series to be 32.3 (fig. 1). Pund and Auerbach (9) report 36.6 years as the average age for "in situ" carcinoma in their series. Te Linde (15) reports the average age in his series to be 37.1 years. It is seen, therefore, that many interesting problems are posed as to the actual incidence of malignancy of the cervix in the otherwise clinically benign-appearing cervix. In 93 percent of the patients in this series no clinical manifestation of any malignant change in the cervix was apparent.

A side light of additional value of the Papanicolaou stain was in deciding on the type of cancer in a patient with anaplastic carcinoma

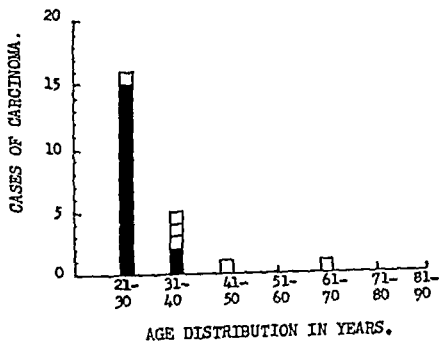


Figure 1.—White area represents the number of cases of invasive carcinoma; black area represents preinvasive carcinoma.



of the uterus. In this instance even after biopsy it was difficult to determine whether it was anaplastic adenocarcinoma or a squamous cell carcinoma. However, the cervical smear revealed cells with a definite keratinized cytoplasm indicating that the tumor was an anaplastic squamous cell carcinoma.

### COMMENT

Sufficient data have been accumulated to indicate the value of the Papanicolaou-Traut cervical smear technique in determining when a specimen should be removed for biopsy. It should be emphasized that the smear is to be used only as an adjunct in establishing a diagnosis of cancer and that a diagnosis of carcinoma must be made only after biopsy. It is true that in some cases, the smear is quite specific in establishing a diagnosis of malignancy, still the source of error in borderline cases makes it imperative that biopsy be done. On the other hand, there were four cases in this series in which smears were positive for evidence of cancer and were negative on biopsy of three consecutive "around-the-clock" specimens. Finally, when a 360-degree conization of the cervix was done, the carcinoma was found. The value of smear screening methods cannot be overemphasized.

The importance of early diagnosis cannot be overemphasized. Cullen (16) in 1921 stated: "It is to the early diagnosis of cancer of the cervix that we must look for future success." At this hospital during the 6-year period from 1942 through 1948, a total of 44 cases of squamous cell carcinoma of the cervix were reported with 4 cases of in situ or preinvasive carcinoma. In contrast, during the 9-month period from October 1948 through June 1949, 27 cases of squamous cell carcinoma were detected by smear technique and proved by biopsy. Of these, 22 cases were preinvasive and 5 cases were invasive carcinoma. Statistics emphasize the value of the Papanicolaou-Traut method for the early detection of carcinoma of the cervix uteri.

### CONCLUSIONS

The cervical smear technique as introduced by Papanicolaou-Traut is of definite value in the diagnosis of early carcinoma of the cervix.

Biopsy of "around-the-clock" specimens of the cervix is not the final procedure in the detection of malignancy. A more accurate method is the serial section of a 360-degree conization of the cervix. In some instances this removes all histologically demonstrable carcinoma.

Cytologic studies are valuable in following radiation response and determining radiosensitivity of the malignant lesion of the cervix.

The Papanicolaou-Traut smear technique should be adopted in properly staffed hospitals as a screening method for the detection of carcinoma of the uterus.

Cytologic study of a smear of the cervix for detection of malignancy should be done on all women at least once a year.

Schiller's tinctorial test of the cervix is valueless in localizing areas of early cancer of the cervix.

## REFERENCES

1. PAPANICOLAOU, G. N., and TRAUT, H. F.: Diagnostic value of smears in carcinoma of uterus. *Am J Obst. & Gynec.* 42: 193-206, Aug. 1941.
2. PAPANICOLAOU, G. N., and TRAUT, H. F.: Diagnosis of uterine cancer by vaginal smear. New York Commonwealth Fund, New York, N. Y., 1943.
3. AYRE, J. E.: Simple office test for uterine cancer diagnosis. *Canad M. A. J.* 51: 17-22, July 1944.
4. AYRE, J. E.: Vaginal cell examination as routine in diagnosis; study of vaginal and cervical cytology as related to abnormal growths. *South. M. J.* 39: 847-852, Nov. 1946.
5. MEIGS, J. V.; GRAHAM, R.; FREMONT-SMITH, M.; JANZEN, L. T.; and NELSON, G. B.: Value of vaginal smear in diagnosis of uterine cancer, report of 1,015 cases. *Surg., Gynec. & Obst.* 81: 337-345, Oct. 1945.
6. KANO, I.: Papanicolaou method of cancer diagnosis; an evaluation. *Minnesota Med.* 32: 54, Jan. 1949.
7. KERNODLE, J. R.; CUYLER, W. K.; and THOMAS, W. L.: Diagnosis of genital malignancy by vaginal smears. *Am. J. Obst. & Gynec.* 56: 1083-1089, Dec. 1948.
8. FOOTE, F. W., and STEWART, F. W.: Anatomical distribution of intra-epithelial epidermoid carcinomas of cervix. *Cancer Research* 4: 431-440, Sept. 1948.
9. PUND, D. R., and AUERBACH, S. H.: Preliminary carcinoma of cervix uteri. *J. A. M. A.* 131: 960-963, July 20, 1946.
10. BAKER, W. S.: Carcinoma of cervix uteri. *U. S. Nav. M. Bull.* 49: 868-877, Sept.-Oct. 1949.
11. FRANKL, O., and AMBRECHT, I.: Histologic changes incident to radium and X-ray therapy of uterine carcinoma. *Surg., Gynec. & Obst.* 33: 162-164, Aug. 1921.
12. ARNOLD, A. N., and STEWART, F. W.: Clinical and histological changes produced in carcinoma of cervix by different amounts of roentgen radiation. *Arch. Surg.* 31: 542, Oct. 1935.
13. WARREN, S.; MEIGS, J. V.; SEVERANCE, A. O.; and JAFFE, H. L.: Significance of radiation reaction in carcinoma of cervix uteri. *Surg., Gynec. & Obst.* 69: 645, Nov. 1939.
14. GRAHAM, R. M.: Effect of radiation on vaginal cells in cervical carcinoma. *Surg., Gynec. & Obst.* 84: 153-173, Feb. 1947.
15. TE LUNDE, R. W.: Editorial: Intraepithelial carcinoma (in situ) of cervix uteri. *Surg. Gynec. & Obst.* 88: 792-794, June 1949.
16. CUTTEN, T. S.: Early squamous cell carcinoma of cervix. *Surg. Gynec. & Obst.* 33: 137-144, Aug. 1921.





# Combination Porcelain and Acrylic Jacket

PLATE V (Contd. from p. 10)

**S**EVERAL types of jacket crowns are being made today and all of them are useful in crown and bridge practices. One type is an excellent replacement for single anterior teeth when an acrylic jacket might be inadequate or being made in some dental laboratory. A crown that will meet the standards of good prosthetic dentistry can be made with a combination of porcelain and acrylic.

A porcelain jacket crown preparation with a definite shoulder at the cervical periphery is made in the tooth to be treated. An impression is taken and an amalgam die is made. Both pieces are duplicated in stone and articulated with the amalgam die in the correct positional relationship. A platinum matrix (Fig. 1) and a thickness is duplicated to the amalgam die in the same manner as for a porcelain jacket. The entire matrix is covered with about 1/16 inch of condensed porcelain of the same shade as that of the acrylic to be used. The encapsulated matrix with damp porcelain is allowed to dry and is then placed in the porcelain furnace and given a low fusion bake. The time and temperature of these porcelain bakes are governed by the type of material used. The semi-baked porcelain is removed from the furnace and porcelain is added, especially to the shoulder area, to make up for the shrinkage that has occurred. It is then placed in the furnace and given a high fusion bake. If an over-fire occurs it can be removed with water-soluble disks or stones. A roughened surface will be more adherent to acrylic material when the matrix is processed with porcelain.

An anterior crown can be treated in this porcelain core, although a manufactured acrylic tooth (Ducor No. 1-51-55) is preferred. When a manufactured acrylic tooth is used, it is cut in half longitudinally and adapted to the labial surface of the porcelain core. Care in checking the bite and contact areas is necessary at this stage. After it is well adapted to the porcelain core, the internal surface is treated to the ammoniac internal form for the tooth to be treated. The entire crown is removed from the die and is then ready for processing. The

jacket crown is invested in stone with the lingual waxed surface exposed to the upper half of the flask. After the wax has been removed by boiling water, the required shade of acrylic is packed onto the tooth and the porcelain-acrylic jacket is cured by conventional standards for curing methyl methacrylates. The most important step here is to cool the flask to room temperature *slowly* before deflasking. Rapid cooling by plunging in cold water will fracture the porcelain core. By carefully removing the crown and trimming judiciously little finishing is necessary (figs 1 and 2). A brilliant gloss is not required as fluids in the patient's mouth will give a natural appearance to the crown. Sometimes a second matrix of mesh platinum is plated over the initial

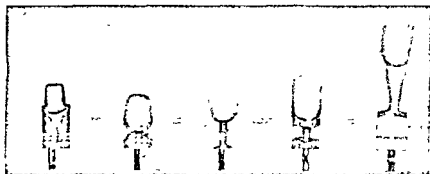


Figure 1—Front view from left to right Amalgam die porcelain core, acrylic facing, waxed-up combination finished jacket

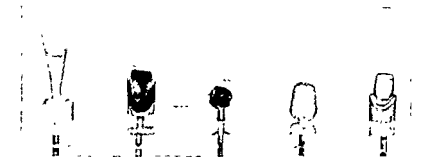


Figure 2—Rear view from left to right Finished crown, lingual waxed surface, acrylic facing, porcelain core, amalgam die

matrix of platinum and the porcelain is baked onto it. This provides added strength but is not essential to the technique.

This combination jacket is especially valuable in that it (a) can absorb great stress because of the external layer of acrylic, (b) has an excellent watertight gingival seal, (c) unites with most cementing mediums, (d) can be altered externally, and (e) is excellent for the average shell crown.

# Malacoplakia of the Urinary Bladder

## Report of a Case

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**M**ALACOPLAKIA is a rare lesion of the urinary bladder first described by Michaelis and Gutmann in 1903, and later named by von Hanseman in 1906 (1). In 1913, McDonald and Sewell (2) reviewed 21 previously reported cases and described 1 case of their own. In their case, lesions were found in the urinary bladder and both kidneys at autopsy. Only occasional cases have been reported since then, bringing the total to approximately 50.

### CASE REPORT

Mrs. W., age 25 years, was first seen in the out-patient clinic in October 1947. At that time she was in the fourth month of her second pregnancy. She complained of gross, painless, intermittent hematuria. There was a history of three previous episodes of gross hematuria that occurred in 1944, 1945, and 1946. (In 1946 she was in the seventh month of her first pregnancy.) The hematuria lasted less than 1 week and each attack of bleeding was associated with urinary tract infection.

On admission in October 1947 the physical examination was essentially negative except for the urinary tract. On cystoscopic examination the bladder appeared normal, but blood issued from the right ureteral orifice. The urine contained numerous red and white blood cells. Urograms revealed a bizarre architecture of the calyces bilaterally, a possible filling defect on the right side, and a 1.5 cm. renal calculus on the left. The urinary tract infection and a moderate anemia, which had developed secondarily to the ureteral bleeding, responded to routine therapy, and she was discharged, symptomatically relieved.

She was readmitted 3 months later, having had hematuria daily since her discharge from the hospital. The findings were similar to those of the first admission. Routine symptomatic treatment was again given, and arrangements were made to terminate the pregnancy as soon as possible and still obtain a viable infant. In February 1948, during the eighth month of pregnancy, a living infant was delivered by cesarean section. The hematuria subsided and the patient made an uneventful recovery.

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In April 1948, she was treated for a left pyelonephritis. Hematuria had been present for 4 days. The symptoms and hematuria then subsided for a period of 11 months. A calycectomy was performed with removal of a calculus from the left kidney.

Hematuria returned for the seventh time in February 1949, and she was readmitted for further study. Significant physical findings were weakness and pallor and a 2-month uterine pregnancy. Laboratory findings: The red blood cell count was 3,700,000; hemoglobin, 10 gm (69 percent). The urine contained numerous red blood cells, no organisms were noted on smear.

On cystoscopic examination bloody urine was noted. The bladder mucosa showed generalized inflammation and bullous edema at the vesical neck. There were two solid, yellowish-brown, moundlike elevations of the bladder mucosa, each measuring 0.5 cm in diameter; one was located anteriorly and laterally to the right ureteral orifice, the other behind the trigone and medial to the right orifice. Blood issued from the right ureteral orifice. Urograms were essentially unchanged from previous studies. PPD tuberculin tests were negative.

Biopsy of a specimen of one of the bladder lesions showed granulation tissue and large numbers of macrophages containing laminated spherical, basophilic bodies pathognomonic of malacoplakia. There was infiltration by moderate numbers of plasma cells, a few lymphocytes, and occasional polymorphonuclear leukocytes. Interstitial tissue was scanty except for a rare fibroblast and a few capillaries. The overlying epithelium was denuded. Biopsy of a second specimen showed essentially the same findings. In addition, however, there was squamous metaplasia of the overlying bladder epithelium. Acid-fast stains were negative for *Mycobacterium tuberculosis*. Attempts to find the basophilic bodies in the urinary sediment from the right ureter and from the bladder were unsuccessful.

The patient received five blood transfusions but continued to bleed. Because of the apparent correlation of the hematuria with pregnancy and also because of the refractory anemia, a therapeutic abortion was recommended and accepted by the patient.

Hematuria continued following this procedure. A phenolsulfonphthalein test, done 8 days postoperatively during cystoscopy, showed the following. The right kidney excreted 10 cc of urine in 10 minutes with 17 percent total dye concentration, the left kidney, 12 cc in 10 minutes with 7.5 percent total concentration. The appearance time was 3 minutes from each side.

The right renal pelvis was lavaged with 5 cc. of 1 percent silver nitrate solution. Twelve days after the abortion and four days following treatment with silver nitrate, the urine became grossly clear.

Since the patient's discharge from this hospital, she has had one recurrence of hematuria.

#### DISCUSSION

*Etiology.*—Many authors of earlier articles concerning malacoplakia attempted to indict *Mycobacterium tuberculosis* as the etiologic agent, inasmuch as in many of their cases pulmonary tuberculosis was found at autopsy. However, the presence of *Myco. tuberculosis* in the lesions was never demonstrated.

Many of the cases reported were associated with an *Escherichia coli* infection of the urinary tract, but again no one has proved a definite etiologic relationship between this organism and malacoplakia.

Rudnick and Ragins (3) reported a case of malacoplakia of the bladder occurring in the presence of severe urinary tract infection associated with unilateral nephrolithiasis. Upon removal of the diseased kidney, the infection and malacoplakia regressed spontaneously. Urine cultures revealed *Proteus vulgaris*, *Esch. coli*, *Staphylococcus albus*, and *Klebsiella pneumoniae*.

Cases have also been recorded in which hematuria was the only symptom.

The occurrence of malacoplakia in such a variety of circumstances suggests that it is a response to nonspecific irritation of the urinary bladder. If such is the case, malacoplakia probably is often not recognized.

Redewill (1) reported a case of malacoplakia in a patient with concurrent lesions of Boeck's sarcoid. He believed that the pathologic findings in both conditions were strikingly similar and concluded that malacoplakia is the manifestation of sarcoid in the urinary bladder. We believe that this is an erroneous assumption. Histologically, the lesions of Boeck's sarcoid are composed of small tuberclelike structures composed of whorls of epithelioid cells with Langhans-type giant cells. Occasionally these giant cells contain an intracytoplasmic inclusion body of calcific material and asteroid bodies. This calcific inclusion body is coarsely laminated, deeply basophilic and irregular in outline, roughly spherical, and has been named the Schaumann-Boeck body. The main cellular constituents of lesions of malacoplakia, although resembling epithelioid cells as described by some authors, are macrophages and are not arranged in tubercle fashion. Also, when multinucleated cells exist, they do not assume the appearance of the Langhans giant cell. The intracytoplasmic bodies diagnostic of malacoplakia are highly characteristic, and differ morphologically from the Schaumann-Boeck body and the asteroid body.

**Pathology.**—As described by most writers, the lesions of malacoplakia grossly are soft, small, rounded nodules, usually only a few millimeters in diameter and slightly elevated above the surrounding mucosa. They vary from pale yellow to gray, frequently have a slightly umbilicated pale center, and are often surrounded by a hyperemic halo. There may be only a few such nodules or they may be quite numerous. Occasionally, several small lesions coalesce to form a single large yellowish-white plaque which may be several centimeters in diameter (6). The most common sites are the posterior wall, the



region of the trigone, and about the ureteral orifices. Morison (4) reported a case in which a large nodule caused obstruction at the vesical neck. The lesions have also been found in the ureters (4) and in the kidneys (2).

The microscopic features are diagnostic and consist of varying numbers of highly refractile, homogeneous or laminated, spherical, basophilic bodies, the so-called Michaelis-Gutmann bodies (figs. 1 and 2). In our case these were numerous and varied considerably in size, some of the larger measuring 12 to 15 microns in diameter, the smaller 2 to 3 microns. Occasionally budlike forms have been reported. Their presence has led several observers to conclude erroneously that they are fungi. Apparently, their main constituent is calcium although small quantities of iron are also present (3). For this reason they have also been called calcospherites. They are usually present, singly or in pairs, intracellularly, although a few are apparently extracellular (2). In contradistinction to the Schaumann-Boeck bodies the calcospherites are finely laminated, moderately basophilic, smooth of outline, and perfectly spherical. Also, asteroid bodies, which are rather frequent in lesions of sarcoid, are not found in malacoplakia.



Figure 1.—Michaelis-Gutmann bodies within macrophages. Plasma cell infiltrate.

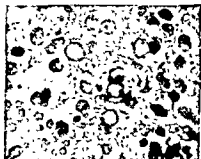


Figure 2.—High-power view showing detail of Michaelis-Gutmann bodies.

In most reported cases the macrophages which contain the calcospherites are the predominant cell type in the lesion. They are quite large, round, oval, or polygonal. Their cytoplasm is pale, eosinophilic, homogeneous, or finely granular. The nuclei may be vesicular, but are usually hyperchromic and somewhat irregular.

In areas where the macrophages are most numerous there is a scanty stroma of reticulum fibers which separates the cells into small islands (3). At the periphery of the nodules numerous fibroblasts are usually present together with an increase in the amount of stroma. Peripherally and at the bases of the lesions are usually numerous endothelial-lined, thin-walled, blood channels.

Symptoms referable to urinary tract infection have been prominent in the majority of patients. Occasionally asymptomatic gross hematuria has been the chief complaint (1) (5), as it was in our case.

Malacoplakia occurs most frequently in women of middle age or older; however, several cases have occurred in younger persons. Morison (4) reported a case in a 6-year-old girl; Oppermann (7) reported a case in an 8-year-old girl and referred to a case in a 9-year-old girl, previously reported by Fraenkel.

#### TREATMENT

Because of the infrequent recognition of the disease process no standardized treatment has been formulated. The lesions have responded to local fulguration in most cases. In Redewill's (1) case the patient's hematuria subsided upon irrigation of the renal pelvis with weak silver nitrate solution. Again, another case spontaneously regressed merely upon removal of a source of infection in one of the kidneys (3).

#### SUMMARY

A case of malacoplakia of the urinary bladder is reported in a 25-year-old white woman whose principal symptom was intermittent, painless, gross hematuria, usually associated with urinary tract infection.

Although hematuria occurred between pregnancies, it became more profuse and constant during pregnancy. This is an interesting but unexplained feature of this case.

#### REFERENCES

1. REDEWILL, F. H.: Malakoplakia of urinary bladder and generalized sarcoidosis; striking similarity of their pathology, etiology, gross appearance, and methods of treatment. *J. Urol.* 49: 401-407, Mar. 1943.
2. McDONALD, S., and SEWELL, W. T.: Malakoplakia of bladder and kidneys. *J. Path. & Bact.* 18: 306, 1913, 1914.
3. RUDNICK, D. F., and RAGINS, A. B.: Malakoplakia of bladder, case report. *J. Urol.* 42: 108-117, Aug. 1939.
4. MORISON, J. E.: Malakoplakia of urinary bladder. *J. Path. & Bact.* 56: 67-72, Jan. 1944.
5. CRISTOL, D. S., and BRODERS, A. C.: Malacoplakia of bladder; report of 2 interesting cases. *J. Urol.* 55: 260-266, Mar. 1946.
6. MCCREA, L. E.: Clinical Cystoscopy; a Treatise on Cystoscopic Technique, Diagnosis, Procedures and Treatment. F. A. Davis Co., Philadelphia, Pa. 1945. Vol. I, p. 153.
7. OPPERMANN, E.: Malacoplakia of bladder. *Ztschr. f. Urolog.* 18: 164-170, 1921.





# Circumcision in the Adult

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**D**URING the past 3 years more than 350 circumcisions were performed on the urologic service at the United States Naval Hospital, Pensacola, Fla. The ages of the patients varied from early childhood to the fifth decade, but the majority were in their twenties. More than 150 of them had early syphilis. Circumcision was done usually on the third day of penicillin treatment for syphilis, at which time the darkfield examination is invariably negative for *Treponema pallidum*. Healing was uneventful and the patients were ready for discharge upon completion of standard treatment—7½ days (6 million units of penicillin) in seronegative patients, and 10 days (8 million units of penicillin) in seropositive patients. Incidentally, among the last 400 patients admitted for syphilis, only 5 had been circumcised. Circumcision was done in three patients in whom a clinical diagnosis of syphilis was postulated but the diagnosis was not confirmed by repeated darkfield examinations and serologic tests. However, histologic examination of the excised prepuce was consistent with a diagnosis of syphilis in two and the third showed nonspecific chronic inflammation. Subsequent follow-up revealed a strong seropositive reaction in the first two patients; the third had a seronegative reaction. Penicillin treatment was only initiated following laboratory confirmation. The circumcisions healed by primary intention in all three patients.

Since over 150 circumcisions of patients with early syphilis have healed primarily, we conclude that early syphilis under treatment with penicillin is no contraindication to simple elective operation, and that circumcision serves several useful purposes: (a) Hygiene is improved for the patient; (b) increased resistance to syphilitic reinfection and malignancy are enhanced; (c) no additional time is lost in hospitalization; and (d) the operation is good teaching material for interns, all of whom should have experience in this simple, valuable operation which, in many cases, is definitely indicated, particularly in the military service.

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# Ainhum

## Report of a Case With Bilateral Involvement

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**A**INHUM or dactylolysis spontanea is a disease of unknown cause characterized by a progressive constricting fibrous band at the base of one of the digits, usually the little toe, with eventual spontaneous amputation of the involved digit. It is confined almost entirely to the Negro race, is uncommon in the United States, but it is frequently encountered in tropical countries. As a rule, only one toe is involved. The fingers are rarely affected.

The disease begins with the formation of a transverse groove in the skin on the flexor surface of the toe at the digitoplantar fold. The groove deepens and spreads circumferentially until the toe is completely surrounded by a narrow fibrous band.

The distal segment becomes enlarged, soft, and bulbous, and atrophy of the nail occurs. Pain is usually absent; however, ulceration may supervene with developing gangrene and pain. There is resorption of the underlying bone until the toe is attached only by a fibrous cord (4) (6) (9) (13) (14). Spontaneous amputation occurs several years after the initial lesion.

Microscopically there is hyperkeratosis, scar tissue formation, and low-grade chronic inflammation. Many of the vessels exhibit an endarteritis, although the significance of this finding has been previously overemphasized (5). The underlying corium is thin and merges with the periosteum so that each can barely be differentiated. A rarefying osteitis is found in the involved bone.

Ainhum has been considered by various authorities as a distinct pathologic entity and by others as a manifestation of a more generalized condition. It has been found in several nonlocalized diseases of the skin. Hyde and Montgomery (19) and Spencer (7) observed it in conjunction with palmar and plantar keratoses. Stelwagon (17) found it associated with pityriasis rubra pilaris. It has also been reported in patients having ichthyosis, scleroderma, and keratoderma.

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tended to the underlying bone. The phalanx was narrow, irregular, and measured 0.3 cm at its smallest diameter.

On microscopic examination a nonspecific fibrosis was observed. At the constricting band the epidermis was thin and showed a complete loss of rete pegs. Hyperkeratosis and parakeratosis were distinct at the site of constriction, although on either side of the band there was absence of parakeratosis. The underlying corium consisted of dense collagenous connective tissue that merged into the periosteum and contained a few diffusely scattered lymphocytes. Rete pegs, sudoriferous glands, and accumulations of lymphocytes were prevalent on either side of the constricted area. In the area of scar tissue formation only capillaries were visible. Some of the adjacent arterioles showed slight endarteritis but the majority appeared normal. The underlying phalanx was irregular and showed osteolytic changes with partial replacement by collagenous tissue. Fat cells filled the trabecular spaces. No inflammatory reaction involving the phalanx could be demonstrated.

#### REFERENCES

1. YOUNG, C., JR. Ainhum or dactylolysis spontanea, report of case. *South M J* 41: 29-31, Jan 1948.
2. SHAFFER, J. O. Ainhum, report of case in which patient was white woman with diabetes mellitus. *Arch Path* 43: 170-176, Feb. 1947.
3. KEAN, B. H., and TICKER, H. A. Etiologic concepts and pathologic aspects of ainhum. *Arch Path* 41: 639-644, June 1946.
4. TYE, M. Ainhum. *New England J Med* 234: 152-154, Jan 31 1946.
5. MARTENS, V. E., and NORRIS, R. F. Pathologic findings in case of ainhum; comparison of epidermal and vascular lesions with normal toe. *U S Nav M. Bull* 45: 745-751, Oct. 1945.
6. VAUGHN, A. M., HOWSER, J. W., and SHEPHERD, G. Ainhum (dactylolysis spontanea) report of 2 cases from Illinois. *Ann Surg* 122: 868-877, Nov 1945.
7. SPENCER, G. A. Ainhum associated with hyperkeratosis palmaris et plantaris. *Arch Dermat & Syph* 45: 574-577, March 1942.
8. TESKE, J. M. Ainhum, report of case. *Arch Dermat & Syph* 44: 1108-1109, Dec 1941.
9. SPINZIG, E. W. Ainhum: its occurrence in United States with report of 3 cases. *Am. J Roentgenol* 42: 246-253, Aug 1939.
10. SUTTON, R. L., and SUTTON, R. L., JR. *Diseases of the Skin*. 10th edition. C. V Mosby Co., St. Louis Mo., 1939. pp 587-589.
11. HORWITZ, M. T., and TUCKER, I. Ainhum; report of 6 cases in New York. *Arch Dermat & Syph* 36: 1058-1063, Nov 1937.
12. HARBOWER, G. Ainhum disease and anesthetic type of leprosy. *Tr Roy Soc Trop Med & Hyg* 29: 73-76, June 1935.
13. FREIDMAN, L. J. Roentgen findings in ainhum. *Am J Roentgenol* 31: 349, March 1934.
14. BROOM, D., and NEWMAN, B. Ainhum, report of case with roentgenologic findings and review of literature. *Arch Dermat & Syph* 27: 763-765, May 1933.
15. GROSS. *Arch Dermat & Syph* 21: 874, 1930.
16. WIGLEY, J. E. M. Case of hyperkeratosis palmaris et plantaris associated with ainhum-like constriction of fingers. *Brit. J. Dermat.* 41: 188-191, May 1929.

17. STELWAGON, H. W.: Treatise on Diseases of the Skin for Advanced Students and Practitioners. W. B. Saunders Co., Philadelphia, Pa., 1914. p. 623.
18. WEINSTEIN, H. A.: Description of ainhum with report of interesting cases in one family. Proc. Med. Assoc., Isthmian Canal Zone 4: 110-121, Feb. 14, 1912.
19. HYDE, J. N., and MONTGOMERY, F. H.: A Practical Treatise on Diseases of the Skin. 7th edition. 1904, p. 608.
20. HORNADAY, E. H.: Ainhum. North Carolina M. J. 8: 116-118, 1881.
21. DA SILVA LIMA, J. F.: On ainhum. Arch. Dermat. 6: 367-377, 1880.
22. CLARK: Tr. Epidem. Soc. 1: 105, 1860.





TABLE 1—Results

Case No.	Sex	Age	Distribution	Pain at onset of treatment	Duration of disease, prior to onset of treatment (days)	Number of injections of procaine made	Results	Observations
1	F	28	L 1-2	Mod. rate	8	4	Pain gone in 48 hours. Vesicles cleared in 4 days.	Three inguinal nodes remained tender 4 days.
2	M	31	L 1-2	Severe	5	4	Pain completely relieved in 4 days.	Prevents the rash with pituitrin with failure.
3	M	21	T 7	Mod. rate	3	4	Pain gone in 72 hours.	No new vesicles after first injection.
4	M	49	T 2-3	Severe	35	15	Four relief of pain.	Skin lesions rapidly regressed and healed. Treatment with acetylsalicylic acid and codeine prior to procaine without relief.
5	M	33	T 5	Mod. rate	7	7	Relief of pain after 4 days.	Skin lesions flattened rapidly.
6	M	20	T 12 L 1	Severe	6	4	No pain after 72 hours.	Inguinal gland tender for 48 hours.
7	M	35	T 6	Mod. rate	4	3	No pain after second injection.	Skin lesions cleared rapidly.
8	M	36	T 5	Severe	5	4	Almost complete relief in 48 hours.	Hemorrhagic bullae healed with only superficial scarring.
9	M	20	T 7-8	Mod. rate	6	4	Pain decreased greatly in 24 hours.	None.
10	M	39	T 1-3	Severe	17	7	Six days of pain, then complete relief.	Pain during first 2 days required use of morphine.
11	M	20	T 2-3	do	1	4	Healed in 2 days.	Temperature 100° F. and headache on admission.
12	P	62	T 7-8	do	10	22	Improved after 10 days. Pain gone in 22 days.	Severe anemia. Severe osteoarthritis with disk degeneration at level of involvement.
13	P	42	T 5	Mod. rate.	1	3	Rapid relief of pain.	Vesicles flattened overnight.
14	P	24	L 1-2	do	10	5	No pain after 3 injections.	Inguinal node tender for 6 days.
15	M	24	T 6-7	Mild	7	5	No pain after 2 injections.	None.
16	M	23	T 5	Mod. rate	6	5	Pain persisted for 4 days, but cleared again after 11 days.	None.
17	P	25	L 1-2	do	8	6	Pain cleared in 3 days.	None.
18	M	27	T 7-8	do	4	3	Excellent results.	Skin lesions hemorrhagic. Procaine continued until they flattened completely.
19	M	38	T 2-3	Severe	6	6	Pain improved after 3 injections and was gone after 6 injections.	None.
20	P	22	T 5	Mod. rate	2	3	Excellent results.	Large, tender axillary nodes.
21	M	32	L 1-2	do	6	3	Pain present for first 5 days of treatment.	None.
22	M	24	C 2-3	Severe	10	5	Pain eased within 48 hours.	Case was treated outside as a contact dermatitis before being started on procaine.
23	P	26	T 5	Mod. rate	3	3	Excellent results.	None.
24	M	22	T 6-7	do	8	6	Excellent results.	None.
25	M	28	T 1-2	Severe	6	6	Pain relieved in 72 hours.	Large axillary glands probably contributed to the severe pain.
26	M	31	T 5	Mod. rate	4	4	No pain after 2 days.	None.
27	P	32	T 6-7	do	7	3	Pain relieved in 48 hours.	None.
28	M	37	T 2-3	Severe	10	5	Good results with extensive involvement and severe pain.	Patient stated he had "shingles" before. Last time took 2 weeks to heal.
29	M	23	T 5	Mod. rate	4	4	Good results.	None.
30	P	72	CN 5	Severe	10	8	Pain relieved in 10 days, gone in 21 days. No vesicles, no treatment.	Severe (old) endometrial malignancy, chronic alcoholic drug addiction.
31	P	23	C 2-3	Mild	5	3	Pain relieved in 3 days.	None.

Thirty-one cases of herpes zoster were treated with protamide, and good to excellent results were obtained in 28. In those failing to respond, other factors besides age of patient may have been involved. Case 4 had had pain for 5 weeks before treatment was begun. Case 12 had severe hypochromic anemia and extensive osteoarthritis and osteoporosis in the area involved. Case 30 was a chronic smoker of 52 years of age, and addicted to narcotics; gastroenteric dysfunction was suspected in her case. No reactions to protamide, either local or systemic, were noted. Routine urinalyses and blood counts were within normal limits in all cases, with the exception of case 12.

# CONCLUSIONS

While this series of cases is small and clinical evaluation of the relief of pain in this disease difficult, it is believed that protamide is of definite value in the relief of pain in herpes zoster. Further vesicles and crusts disappear much more rapidly than in untreated cases.

The relief of pain was superior to that obtained when using either pituitrin, thiamine chloride, autohemotherapy, sodium iodide, or high-voltage roentgen therapy.

The advantages of protamide are the simplicity and absence of pain in administration, lack of reactions, and its apparent safety.

# REFERENCES

1. ORMSBY, O. S., and MONTGOMERY, H.: Diseases of the Skin. 7th edition. Lea & Febiger, Philadelphia, Pa., 1948.
2. BINDER, M. L., and STUBBS, L. E.: Treatment of herpes zoster with aureomycin. J. A. M. A. 141: 1050-1051, Dec. 10, 1949.
3. COSTELLO, R. T.: New treatment for "lightening pains" of tabes dorsalis. Urol. & Cutan. Rev. 51: 260-263, May 1947.
4. LEHMAN, A. J.; CHASE, H. F.; and YONKMAN, F. F.: Pharmacologic study of protamide. Urol. & Cutan. Rev. 48: 378-381, Aug. 1944.



ies made during and immediately subsequent to the recent war (2). It has long been considered that these tendencies were indicative of the individual's inability to perform adequately in the Armed Forces. This study, however, revealed little significant difference between the three groups. Of those traits customarily classified as conversion manifestations (with the exception of the complaint of headaches), the probation violator was not exceptional. The two better adjusted groups consistently totaled a higher percent of anxiety manifestations than the probation violator (fig. 4).

### DISCUSSION

It was hoped that by comparing the probation violators with two other groups, certain identifying characteristics could be noted in the preservice environment of the individual which would enable psychiatric examiners at induction centers to predict the potential offender. This study succeeded partially; however, no single factor stands out. This group shows certain tendencies which are strongly suggestive for classifying certain individuals as potential general court martial offenders.

*Physical condition.*—Physically the probation violator is in sound condition. He was considered to have been a nervous child.

*Home background.*—Such factors as size of family, lineal position in the family, and age of parents at birth of child vary so slightly among the three groups that their positive diagnostic value is doubtful. Of greater importance is the broken home situation, whether it is due to death, separation, or divorce, and the age at which the break occurred. Health of the parents and health of the subjects's wife are important. Of greater significance than the fact that the parents were unable to get along with one another is the fact that the probation violator was unable to get along with his parents. This indicates an unpleasant home situation. Unsatisfactory foster homes appear frequently in the background of the probation violator. Punishment, when it engenders a feeling of persecution or rejection and the solution of his problems by flight, increases the probability of the inadequate solutions by these persons to problems in service life.

*Socioeconomic background.*—Evidence supporting the principle that a bad community necessarily produces delinquency has only weak support. Poor financial status or poverty occurred in a large number of homes from which the probation violators came. This individual is not unusual in the matter of truancy or in having frequently been committed to a reform school, but he differs significantly in having been committed to jail or civilian correctional institutions. Probation violators consistently get into trouble because of overindulgence in alcohol.

*Marital.*—The probation violator is willing to “try” marriage at a relatively early age; consequently, he exhibits a higher separation and divorce rate than the others.

*Educational background.*—Mentally, the probation violator is dull and inadequate. Repeated failures in school through inaptitude, resentment, and poor ability to adjust are apparent.

*Self-evaluation.*—The probation violator tends to overevaluate himself in terms of his actual performance.

*Early neurotic traits.*—There was no significant difference among the three groups in regard to the manifestation of early neurotic traits.

#### PROFILE OF THE PROBATION VIOLATOR

The probation violator in his childhood showed evidence of his later personality traits by revealing, at an early age, his reaction to his poorly adjusted parents who were apt to have ill health based on poorly defined disorders, probably neurotic in origin. Their marital adjustments were unsatisfactory, and the events leading up to the disruption of the home (usually prior to his sixteenth birthday) produced in him a feeling of resentment and rebellion which were reflected in his later conduct. Poverty, and frequent shifting of home and interest, contributed early to the development of insecurity and a tendency to seek the pleasure of the moment because of the uncertainty of the future. This hedonistic need began to lead to minor delinquencies which earned for him the title of “black sheep.” The early disruption of the family resulted in his placement in various “homes” which further contributed to his insecurity and inadequacy. His own lack of respect for authority, fostered by the poor example of his parents, the severity of the punishment they inflicted for minor breaches of discipline, the poor example set by his relatives, many of whom came in conflict with the law, and his own search for the “easy way,” brought him into early and not infrequent conflict with the police.

He early demonstrated a tendency to seek flight as a solution to his conflicts. He was frequently truant when school became difficult, and left usually after several failures. He ran away from home if his parents became demanding. When physical flight became impossible because the conflict was within himself, he escaped by means of alcohol which further contributed to his difficulties because a false sense of well-being and superiority fostered by the alcohol made him belligerent and brought him into further conflict with authority. He frequently sought escape into marriage, but here found little comfort and as a consequence was divorced and remarried but not living in harmony with his second wife. Finding no satisfaction in his pur-

suits, having no education for higher skilled tasks, he eventually entered the military service where his pattern of flight continued.

### CONCLUSIONS

It must be admitted frankly that this study has fallen short of its original objective. It is believed, however, that sufficient value lies in the general psychologic profile of the probation violator to warrant its publication.

The lack of success is attributed in part to the following causes:

(a) The intrinsic difficulty of establishing such criteria.

(b) The lack of a control group in the true sense of the word. Such a group should have consisted of men who had successfully completed a period of probation subsequent to a general court martial and confinement. Due to administrative difficulties such a group was not available at this time.

(c) The tendency on the part of the general court-martial prisoner to conceal or evade questions relative to his past experiences, with the desire to appear as "no worse than the others," may have decreased the area of difference in many cases.

(d) No set of characteristics in which the probation violator was consistently high and the other groups correspondingly low was isolated. It is, therefore, suggested that a substantial constellation of these elements should appear in the experience and personality of the individual before he is discarded as a potential recidivist.

Much work must yet be done by the psychologist and the psychiatrist in this problem of probation violation, as well as in the problem of eliminating the original general court-martial offender. This study is presented in the hope that where we have succeeded others may take up the lead and follow through to a more successful conclusion and that others may profit by our mistakes.

### REFERENCES

1. INGHAM, H. V. Statistical study of family relationships in psychoneurosis. *Am J Psychiat* 106: 91-98, Aug. 1949.
2. GLASS, A. J. Attempt to predict probable combat effectiveness, by brief psychiatric examinations. *Am J Psychiat* 106: 81-90, Aug. 1949.
3. JOHNSTON, W. C. B., and OTNESS, H. R. Study of 200 violators of General Court Martial probation. *U. S. Nav. M. Bull* 48: 81-92, Jan.-Feb. 1949.



# Current Trends in Medical Education<sup>1</sup>

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WE ARE just rounding out the first 50 years of the twentieth century, an era of medical progress unequalled during any similar period in history. Medical education has played a vital part in this achievement. Because medical textbooks often become obsolete even before the printer's ink is dry, and medical students begin their formal education from 5 to 10 years before they engage in the practice of their profession, medical educators are faced with a serious problem. A therapeutic solution taught in school today is not necessarily valid when an identical situation presents itself to the graduate 5 years later. Medical education, therefore, must work with a flexible curriculum molded to meet the demands of the present and to anticipate future trends. Faced with an ever-changing scientific order where that which was strange yesterday becomes commonplace today, and that which is commonplace today becomes antiquated tomorrow, medical education cannot rest on its laurels but must show continued progress or fail in its purpose. Constant, directed adjustment of subject material and a frequent reapportionment of time to subjects taught is vital to educational growth. Thus the mucosal ulcerations of typhoid fever must be assigned a respectful niche in the hall of medical curiosities, while cancerous ulceration of the intestine is placed under the investigative floodlight. The long periods of time spent in teaching the pathologic changes of red and gray hepatization of lobar pneumonia must be diverted to the study of degenerative heart disease.

Medical sciences are reverting to the basic sciences. The curtain of inaccessibility that surrounded the unexplored hinterland of medicine is being pushed back by discoveries in the basic fields. Operations are more successful today not because of improvement in the technical surgical skills, but rather because of a more thorough knowledge of

<sup>1</sup> Presented at the monthly Medical Meeting, Army Medical Center, Washington D. C., 18 May 1950.

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the intricacies of preoperative and postoperative care which are fundamental contributions of biochemistry. Regions of the body once inaccessible to the surgeon have been rendered accessible by advances in anesthesiology, which in turn is little more than applied physiology and pharmacology. The greatest single recent contribution to the therapeutic armamentarium of the physician—penicillin—came from the laboratories of basic science.

As the knowledge of medicine became more extensive there developed in medical practice the trend toward specialization. This tendency continued to the extent that as each new facet of a specialty was brought to light the process of fission gave rise to another until the number of subspecialties became legion. The movement is by no means new for, in the year 1854, at a meeting of the American Medical Association a resolution was introduced concerning the problem of specialization. A survey of medical students will reveal that about 50 percent of them wish to be specialists and this is not surprising in view of the fact that all who control undergraduate and graduate medical education are specialists. If this selectivity continues the organization of the medical profession will eventually become unbalanced. If 80 percent of the conditions bringing a patient to a physician can be handled adequately by a general practitioner then, in the interests of conservation of manpower and man-hours, we as medical educators are wasting a large portion of our time.

There has been evident, especially since the close of the last war, a rather bitter resentment on the part of the general practitioner against the favored lot of the specialist. Undoubtedly there is just cause for a certain amount of this, and the belief of the general practitioner that unfair discrimination exists has welded together a vigorous and vociferous Academy of General Practice. Medical educators are vitally interested in what path the medical profession will follow. Some would have us believe that eventually all physicians will be specialists and the future pattern of medical practice will be that of group clinics. They argue that lines of rural communication are improving and rural hospitals are springing up all over the country, hence this system will work in both rural and metropolitan communities. It is difficult to understand the logic of this reasoning, for such a plan of education and practice would result in a tremendous waste of time and personnel. Why train every physician to a specialty level when only 20 percent of man's ills require specialist care? The medical trainee as it is must follow an arduous, time-consuming course of studies before he "arrives" and it is doubtful that the lengthening of this training period would stimulate the enthusiasm of medical aspirants. Furthermore, human nature being what it is, one might predict that once a profession composed entirely of specialists had

been established there would arise a hierarchy of superspecialists. I believe that the general practitioner, in an improved version, is a permanent fixture on the American scene.

The latest statistics released by the American Medical Association reveal that there are now 200,000 physicians in the United States, one for every 750 people. This is the highest ratio of any nation in the world with the exception of the newly founded state of Israel where a higher proportion of physicians exists as a result of the great exodus of Jewish physicians from Europe. Social planners would have us believe that a real dearth of physicians not only faces us now but that the situation will continue to deteriorate unless schools of medicine greatly increase their numbers of graduates. Before accepting such a statement there are several factors to be considered. As certain procedures incorporated in the art of medicine became standardized they were turned over to subprofessional personnel. The early radiologists, for example, took their own roentgenograms, developed them, interpreted them, and followed the whole procedure from beginning to end. Such a situation does not exist today for the technician has assumed the responsibility for two-thirds of this procedure. By this transformation physicians have been freed from countless technical details and have more time available for direct patient care. There is no reason to believe that this trend will decrease.

Medical discoveries such as the antibiotics have led to the control of most acute infectious diseases and vast amounts of time have been released to physicians. Recently, I made rounds on the wards of a large municipal hospital that I had not visited since the completion of my internship and surgical residency about 10 years ago. The outstanding impression I carried away was the scarcity of patients with acute inflammatory diseases. Beds that 10 years ago were occupied by patients with lobar pneumonia, acute mastoiditis, and cellulitis of the extremities were used for other purposes. Is it illogical to assume that in another 50 years the proper physician to patient ratio might not be 1:1000?

During the first half of the twentieth century life expectancy in the United States has increased by about 20 years. Since 1900, although our population had doubled, the number of persons over 65 years of age has quadrupled. The age shift carries with it profound medical, social, and economic implications. Geriatrics will soon be no less important than pediatrics.

Man has created war weapons capable of delivering devastating blows into the very heart of the remotest enemy territory which means that, in the next war, civilian casualties will probably approxi-



mate or even outnumber military casualties. It was well demonstrated in the past world war that the successful handling of casualties from areas of catastrophic damage depended on organization. A skilled surgical team is of little value if the injured cannot be brought in for care. This organization for catastrophe should be of vital concern to medical educators. No medical student, whether he plans to practice in a rural or a metropolitan community, whether he anticipates service as a military surgeon or not, should be permitted to graduate without some basic training in this problem of mass casualties. The medical R. O. T. C. is bearing the brunt of this educational program at present and well it should, for the Medical Corps of the Army is well qualified to instruct in this organizational problem. Lest these words be taken as the superficial compliments of a guest speaker to his hosts, I should like to add that Saint Louis University School of Medicine has, by over 100, the highest R. O. T. C. enrollment of any medical school in this country. Such interest is readily obtainable if the students realize that the medical school administration stands behind the professor of military science and tactics.

There has been criticism both by certain of the curricular-hour-conscious faculty and time-pressed students but, on careful explanation of the program, I have been able to impart to these critics my feelings of deep responsibility and obligation in this time of international tension for the indoctrination of every medical student with basic information regarding planning for catastrophe. In my opinion the inculcation of military medical organization in students of medicine will, in the event of a national disaster, result in the saving of thousands of lives.

Graduate professional training given in the Army hospitals since the last war has been of a high order. It is distinctly to the advantage of medical education that military medicine stands at the highest level of professional and administrative skill since its inception. Furthermore, the close liaison between the military and civilian medical professions is of utmost importance in these days of international unrest. My only fear at the moment is that false economy might inadvertently destroy the results of these years of coordinated labor on the part of military and civilian physicians alike. In the not impossible event of war, it would be a tragedy to find an emasculated Medical Service! My experience in the past war convinced me of the inestimable morale-building value of a well-coordinated, smooth-functioning medical service. In the face of possible future mass destruction of the civil population dare we trifle with the structure of military medicine when its units must form the nucleus on which civilian medicine will depend for organization? Civilian morale in any future war may well determine victory or defeat.

The last two decades have witnessed a renaissance of certain social movements in the United States which may have an important effect on the future of the medical profession. Basically two sections of our population have brought about this resurgence of social consciousness, namely the labor unions and the farmers. These elements have exerted a great political pressure on our country and there is no reason to believe that this will decrease. Medical leaders of today must appreciate these trends in public thinking and demonstrate their readiness to assume the leadership in the solution of social problems. Medical schools in great part have failed to educate students as to their social responsibilities. In an effort to remain within the bounds of pure science, educators have shunned this problem, and this neglect is largely responsible for the serious socioeconomic crisis now faced by the medical profession. We take great pride in developing a student who is capable of making a most difficult diagnosis and yet suffer few if any pangs of remorse as this brilliant young physician demonstrates an utter ignorance of his social responsibilities to his patients.

#### PREMEDICAL PREPARATION

There is no standard premedical curriculum nor, indeed, should there be one. The Council on Medical Education and Hospitals of the American Medical Association and the Association of American Medical Colleges have prescribed basic minimal requirements for entrance into medical school but beyond these prerequisites no further curricular advice is submitted. Schools of medicine differ somewhat in their admission regulations but most academic bulletins include fairly standard minimal quantitative, qualitative, and subject requirements. The combined credit hours of the premedical subjects, however, do not comprise half of the total required for college graduation. Thus wide latitude is presented in the choice of elective studies. Professional scientific education has become so time-consuming in terms of years of preparation that there has developed in educational philosophy, a trend in the direction of pruning off all curricular activities not directly related to acquiring a degree. This is unfortunate for, while it is usually accepted that the studies pursued in the undergraduate years must have some relationship to the subject matter of the medical curriculum, a broad educational foundation is indispensable to the development of a well-rounded physician. It is important that the applicant to the school of medicine shall have acquired that culture which has been traditionally associated with the Bachelor of Arts degree.

Dr. Rappleye, Dean of the Faculty of Medicine at Columbia University, in a recent paper<sup>2</sup> writes that "college preparation for medi-

<sup>2</sup> Read at the Thirtieth Annual Meeting of the National Health Council, 24 March 1930

cal, dental, and public health fields should not be preprofessional in character" and that "education is not 'pre' anything, but should be devoted to the objective of providing as broad a cultural education as the institution can provide." The lack of sound cultural education has led to a state of affairs where the technologies have far outstripped our social and spiritual structure. Man splits the atom and then cowers in fear lest this scientific monster turn and destroy its creator. Dr. Allen, president of the University of Washington, has aptly stated that well-rounded development of character and personality are "qualities never lacking in good physicians and without them intellectual development, however brilliant, is socially useless and possibly dangerous." In the selection of medical students scholastic achievements cannot be substituted for excellence in character. The school of medicine carries deep responsibility in ascertaining insofar as possible the capability of the applicant to use the knowledge and skill to be acquired through medical education in a manner beneficial both to society and to himself.

There is no such thing as a typical premedical student and medicine rather than being a single career is actually a multiplicity of careers. Although the art and science of medicine may embrace the philosopher as well as the technician, the recluse as well as the extrovert, the poet as well as the statistician, each applicant to the school of medicine should present substantial evidence that he or she has mastered the basic fundamentals of chemistry, physics, and biology, and furthermore that this mastery will continue into the period of formal professional training. Now that we appreciate the acceptable qualifications of an applicant, our greatest problem is that of determining whether he has these qualities. How can we as members of an admissions committee be sure that a proper blending of the necessary academic and character ingredients exists? The transcripts of grades and admission tests present certain alphabetical and numerical ratings that give a more or less comfortable assurance as to the applicant's intelligence, but how does one determine character? Letters of recommendation are of value only insofar as the testator's objectivity is reliable. I maintain that without much difficulty a graduate of Sing Sing could obtain letters of recommendation that would present him in a favorable light as a candidate for a divinity school.

Numerous papers have been written on the methods of interview best suited to determine qualifications for admission to a school of medicine. Some prefer the "solo" interrogation system in series so that the applicant is never outnumbered in this battle of wits. Others still prefer the "police court" system where the would-be physician

faces a battery of interrogators. I doubt the real contribution of this method of evaluation. How many of our medical leaders of today would receive high scores on an interview basis? Certainly, actual contact reveals information as to dress, speech, and mannerisms but can this be interpreted in the light of future success or failure in medicine? We may question at length the applicant's motivation in his desire to study medicine but how can we be assured that the answers are fundamentally honest? I do not wish to imply that character recommendations and personal interviews should be dispensed with in the selection of medical students, but rather to caution lest too important a role be assigned these adjuncts of the admission committee. Frankly, those who might be best qualified to judge admissibility are not the faculty of medical schools, but rather the premedical faculty, who have had opportunity to follow these aspirants through 3 or 4 years of preparation. A close liaison between the medical and premedical faculty may be of inestimable value in the problem of proper selections. In view of the fact that the ultimate choice of the men and women who will become the future physicians of America rests solely in the hands of admission committees of the medical schools, it is the responsibility of these committee members to consider their roles with deep seriousness.

#### THE PRECLINICAL CURRICULUM

Strict departmentalism presents a barrier to the correlation of the medical school curriculum both horizontally between contemporary subjects and vertically between the preclinical and clinical years. A medical faculty which appreciates that its prime responsibility lies in teaching the science of medicine and not the science of biochemistry or physiology is wise indeed. To each department head his subject is the cornerstone of medicine and a dean must practice all the wiles of diplomacy in order to balance the intellectual budget of curriculum hours. Through the past 50 years various basic departments have attracted the spotlight of attention, beginning with anatomy and continuing to the present with biochemistry now standing in the center of the preclinical stage. The lack of horizontal correlation between subjects taught concurrently results in a great loss of time, integration, and cohesion. One technique of color picture printing involves the serial superimposition of three or four basic colors in the formation of the finished product. Any one basic print, if studied alone, would give an inadequate idea of the final scene, and yet this is the system too often used in preclinical instruction. How inefficient to study the structure of the stomach in the anatomy laboratory and then at a different time and place restudy the muscular functions of this same organ in

physiology and again the secretory functions in biochemistry. By combining the study of structure and function not only is precious time saved, but even more important the final picture is correlated, clear, and complete.

Departmental boundaries shift with time and place. Who is to determine where the dividing line between biochemistry and physiology lies? Will the lectures on digestive secretions fall to the lot of the biochemist or the physiologist? The exact point of division is of little significance and a partial erasure of departmental lines with closer correlation in the teaching program is desirable. The correlation must, however, be intelligently supervised lest certain subjects be covered more than once and the others not at all. The shortness of the time the student is exposed to these courses makes it imperative that the faculty select their instruction material carefully.

Too often the first 2 years of medical education present the student with a mass of facts far in excess of that which he can retain, until the poor bewildered recipient of this deluge of instruction vainly struggles to remember faster than he forgets. Some medical wit has said that the difference between a freshman and a sophomore student is that when the professor says, "Good morning," to the first-year class they reply in like manner verbally, but when the second-year class is thus greeted they promptly write it down in their notebooks. There is grave danger in a curriculum which is so overwhelming in its factual presentation that it tends to create memory experts and destroys the investigative scientific initiative of the student. Furthermore, medical educators in the basic sciences must beware lest they develop a philosophy among their students that the printed scientific word is final. The effects of such distorted thinking become evident in the laboratory when the student's prime interest lies in the attempt to direct the results of his experiments to conform with those of the textbook.

Every preclinical student should have available the time and facilities to stimulate his curiosity and originality. The administration of a medical school should make it possible for a student who so desires to spend an additional year or two in research in one of the basic sciences. *Saint Louis University School of Medicine* has established assistantships encouraging the medical student to participate in such a program. A vertical correlation of the preclinical and clinical curriculum is of value in emphasizing the importance of certain rather prosaic courses. For example, in discussing the various tracts of the spinal cord in neuroanatomy, the Department of Neurosurgery might well demonstrate a postoperative chordotomy in which the spinothalamic tracts have been sectioned; or during the dissection of the

inguinal region on the cadaver the presentation of various types of inguinal hernias will serve to enliven the interest of the student in his partially dissected corpse lying in its academic shroud. Whereas a certain amount of clinical information might well be given the pre-clinical student, I cannot consider it good pedagogy to expose the freshmen and sophomores to advanced clinical subjects for which they do not have the proper foundation. Such instruction leads to *incorrect interpretation and faulty habits of deduction*. *Enthusiasts who prematurely would release students to advanced clinical courses with the explanation that they must learn to reason and correlate for themselves are acting on a false premise.*

Next year at Saint Louis University School of Medicine the academic session will be broken into three periods of 13, 10, and 10 weeks in order that the Christmas and Easter vacations might fall at the close of a period. Thus major examinations are completed before the vacations and the student goes home to relax rather than to wear himself out cramming for semester tests. Frankly the incentive for this change came from my memory of the severe mental conflicts during Christmas vacations in reference to the question to study or not to study.

#### THE CLINICAL CURRICULUM

Until recent years, the preclinical departments have, with some relief, turned the third-year medical students over to the clinical faculty and then have forgotten about them. Current trends in medical education stress the necessity for close correlation between the preclinical and clinical curriculum. The biochemist should participate in discussions of preoperative and postoperative fluid balance just as should the physiologist contribute to the general presentation at a clinical *pathologic conference on renal failure*. *The value of such correlation lies not only on the better instruction of the student but also in the stimulation of mutual interest on the part of clinician and basic scientist alike in a clearer understanding of their common problems.*

Long hours of classroom lectures have been replaced by clinical clerkships. This is good pedagogy. I remember very little of my classroom lecture on the catatonic phase of schizophrenia but indelibly recorded in my memory is the schizophrenic girl with masklike features who held her arm fixed in any position to which the psychiatrist moved it. Instruction in the presence of the patient for small groups of students permits a teacher-pupil intimacy that cannot be reproduced in the classroom. The pendulum of clinical medical education is swinging even further than small group instruction and on to the preceptorial method of teaching. This system has been held in high esteem since the earliest historic period and was the accepted vehicle

for training physicians until late in the last century. I have given serious consideration to the advantages of the preceptor system and have inaugurated a student apprenticeship this year that has acted as a pilot test for future application.

One of the important values of a preceptorial form of instruction is the development of a better appreciation of the fine art of physician-patient relationship. Just how does one approach Mrs. Smith to inform her that she must have her breast removed because of a malignant growth? The student may give a scholarly discussion on the diagnostic interpretations of a bleeding nipple or the fine points of microscopic differentiation between a scirrhous carcinoma and an intracystic papillary adenocarcinoma, but at the same time may be ineffectual and callous in his attempts to discuss the situation in simple practical terms with the patient. Such intimate teaching methods require an increased faculty. The use of younger instructors is the solution to this problem. I have been most satisfied with the high caliber of teaching and the degree of enthusiasm demonstrated by the recent graduates from residency training. Because of their recent educational exposures these younger men and women are in a position to differentiate between good and poor methods of instruction. Furthermore, they have more time to donate than do their older colleagues. Medical schools have not been sufficiently aware of the unlimited teaching talent existing in their recently graduated physicians.

A horizontal correlation of contemporary subjects is just as important in the clinical as in the preclinical years. Much of our instruction stimulates the student to think in terms of departmental boundaries, and this is a serious pedagogic error. Too frequently the junior and senior student on the surgical ward thinks only in terms of surgical diseases and then of psychosomatic conditions alone while on the psychiatry service. We cannot afford as medical educators to forget that the subject matter of interest to the student should be the patient as a whole rather than any artificial subdivision of the patient formulated to suit the convenience of a hospital or a school of medicine. In keeping with this concept, Saint Louis University School of Medicine in conjunction with The University Hospital has established a pediatric heart clinic planned along the lines of a functional unit. This clinic falls under the jurisdiction of neither the department of medicine nor of pediatrics. It is staffed by a functional team of a pediatrician trained in child heart diagnosis, a radiologist familiar with the diagnostic problems of pediatric heart disease, a pathologist experienced in congenital cardiac anomalies, and a surgeon trained in congenital cardiovascular surgery. These men are erasing the boundaries of departmentalism and students are being influenced to think in terms of whole functional units.

A well-staffed, smooth-working university hospital might well be the envy of the medical profession and yet because of its very efficiency there may be certain educational shortcomings in that a student in his clinical years on the hospital wards may gain a distorted notion as to the relative frequency and importance of disease entities. An instructor finds that it is easy to interest his students with a discussion on a rare malady. Thus uncommon and difficult cases become the daily fare. *Unless the teacher makes an effort to evaluate the relative frequency of diseases the student will graduate without appreciating the fact that patients partially disabled by chronic or minor illnesses, who are not admitted to hospitals, make up a large percent of those who are sick.* I must confess that following my training in surgery, whereas a gastric resection presented no serious problem there were certain minor surgical conditions that strained my ingenuity simply because, during my residency, I had not had the opportunity to become familiar with them.

The clinical student must appreciate that hospital pajamas are a great equalizer of men. The bank president and the bank clerk may look exactly alike removed from their environmental background. Their symptoms may be identical and their ulcers may look alike under the fluoroscope. Since, the one might easily afford a trip around the world to ease his nerves, while the other possibly could not obtain the funds for a trip to the nearest pleasure resort, ideally the student should be given opportunities to follow the study of his patients into their home environments.

Although space does not permit a discussion of internships and residencies, medical schools are interested in this phase of graduate training. One cannot draw a line between the senior medical student and the intern and state that there is any basic difference in the educational formula to which these students should be exposed. There is actually much less instructional difference between the senior medical student and the intern than there is between the preclinical sophomore and clinical junior years of medical school. Ideally the postgraduate hospital training should be under the direct supervision of the school of medicine. There is a definite trend toward "straight" internships and some believe that the "rotating" internship will soon be a thing of the past. I do not consider the "straight" type of service an internship but rather feel that it is a first year in a specialty residency program. This trend is of great importance to schools of medicine in that the type of training afforded by "rotating" internships must be made available to the student prior to graduation. In other words the junior and senior students will be acting in the capacity of interns and the intern year must of necessity be absorbed into the undergraduate clinical curriculum.



The successful practice of medicine entails a dual progression, namely, progress in the art as well as in the science of medicine. In order that the art might flourish it is necessary for the physician constantly to return and refresh himself by dipping generously into the ever-progressing river of science. The voodoo witch doctor practices an art of healing but his failure lies in the lack of coordination with the science of healing. We shall fail as educators unless the student is imbued with an insatiable desire to continue studying throughout his professional career. The ceremonial function for the granting of a diploma is well termed, the Commencement, for, to the true physician, this is but the initiation of a never-ending process of medical education.



# Coordination of Administrative and Professional Effort in Army Hospitals<sup>1</sup>

WARNER F. BOWERS, *Colonel, MC, U. S. A.*<sup>2</sup>

**A**LTHOUGH the average hospital operates as though there were an unbridgeable gap between administrative and professional functions, actually they overlap. The necessary coordination and cooperation are founded on mutual respect, understanding of the problems of each, and, above all, a common goal, namely, optimal patient care. Please etch on your memory the fact that were it not for patients, there would be no need for physicians; and were it not for physicians, there would be no need for nurses or for the ancillary corps. This point is too often forgotten by Medical Service Corps officers, nurses, and physicians. Let me emphasize the importance of the middle word in the name of one ancillary corps—service. The connotation of this word has been known to physicians and nurses for centuries but is relatively unfamiliar to the nonmedical assistants who, in ever increasing numbers, are becoming concerned with the care of the sick and injured. Wider realization of the benefits of service to others with its broadest implications, would be of the utmost assistance to the country as a whole in these times of arrant self-seeking.

The sooner we realize that all those who work in the hospital are part of a team striving for a common end, the sooner shall we attain the goal of optimal patient care. Patients are querulous, uncertain, and insecure because of their illness, its strangeness to them, the uncertainties of the outcome, and the unfamiliar hospital surroundings. What is a daily routine to you and of no particular moment may be of great seriousness to a patient. Consequently, patients need more than average consideration and sympathetic handling. This, of course, does not mean coddling, overprotection, or encouragement of self-pity. Nor does it mean that convalescent patients should be treated like

<sup>1</sup> Presented to class of Medical Service Corps and Women's Medical Specialist Corps officers taking the Improved Management Methods Course at Valley Forge General Hospital, 4 April 1950.

<sup>2</sup> Office of the Surgeon General, Department of the Army.

sick patients. Convalescent patients must be made to feel that duty is preferable to remaining in the hospital and this requires an entirely different method of handling. Nurses will tell you that patients who have been very ill cannot understand the apparent change in the attitude of nurses and physicians as they get well. Such patients often feel abused until an explanation is given.

Most of the patients' contacts in the hospital are with persons other than the physicians. Patients themselves do not realize the necessity for this and often complain that they rarely see a physician. Patients take medical care for granted and the other contacts are the ones longest remembered. Patients remember the food and general atmosphere rather than treatment received. Since these are the facts, it is essential that we make every member of the team aware of the importance of nonmedical contacts. To visitors, the most important person in the hospital often is the enlisted man at the information desk or switchboard. To the patient, the most important contacts are with enlisted man, nurse, and physician in the receiving room. It takes a lot of later favorable impressions to counteract the first unfavorable reaction to lying on a stretcher for a long period in the receiving room waiting for someone to do something.

You probably feel that after the course you have received, you fully appreciate the implications of what I have said. When I read a preliminary draft of this paper to interested officers in our office, I was told that I was talking about ancient history and that all was now changed. However, having had some experience as a reactionary, I feel that this is a little optimistic. I wish it were that easy to change what has been accepted for years. This will become readily apparent at your first duty assignment when you will discover that it will take a continual struggle to put across the new ideas you have been taught; anything new accepted only with great difficulty. If you believe that our hospitals are run for the benefit of sick patients the following questions are still pertinent. For whose benefit do we arouse patients at 0530 hours? Few well people arise at that hour and I cannot be convinced that it is beneficial for the sick. For whose benefit do we serve the evening meal at 1630 hours? What well person eats dinner at such an hour? This simply forces patients to stuff themselves later at a snack bar or get into trouble by raiding the ward-kitchen icebox. For whose benefit are supplies neatly stacked on shelves in locked warehouses? Many instances can be quoted in which professional services submit requests or make complaints about nonavailability of needed items which have been in their own medical supply warehouse all the time. Medical supply officers should urge chiefs of service to go through the warehouses periodically or perhaps distribute lists of

newly acquired items at suitable intervals. For whose benefit do we keep patients in hospitals for days or weeks after they are fit for duty while some clerk shuffles the papers, writes for a service record that could have been procured weeks earlier, or does many things that could be done just as well after the patient has left the hospital? In none of these and many other instances can it truthfully be said that we are basing our system on the best interests of the patient.

Mutual respect and cooperation depend largely on the feeling that the other person knows his job and is doing it well. This feeling can be only incompletely present unless we know what he is supposed to be doing and why. This point cannot be stressed enough. Physicians especially are guilty of failing to understand the necessity for what they consider red tape. Why are three copies of certain correspondence necessary? Because three separate offices must maintain a record file. Why must the supply officer have a written request? Because he must have something to show why, when, and to whom he made issue. Why must the clinical records be complete and accurate? Because they frequently become evidence in legal or administrative procedures, even years later. Why must the registrar be notified of the decision to discharge a patient as soon as the physician can make up his mind? Because records must be obtained from elsewhere, orders must be issued, and other time-consuming procedures are necessary. I have always found it advisable to explain these matters in detail to officers on a professional service, repeatedly and at regularly scheduled conferences. Conversely, I have always found it advantageous for all officers, administrative and professional, to attend the regular staff meetings in which professional matters are discussed. *This necessitates a little extra work to insure that what is said is clear to all present, but the increased mutual understanding justifies the added effort.* Many times when you do not get along well with another person and have a developing feeling of antipathy, it is because you do not know him well enough and are not acquainted sufficiently with his problems and aims; this is particularly true with groups of people such as those in the various hospital services. If you are not getting along well with those in another service in the hospital, it is possible that you are at fault because of a narrow outlook or insufficient understanding of the problems involved. Learn all about the other services, their aims and problems before passing judgment or commenting unfavorably on them.

One other problem has become a cause for serious alarm both in the service and in civil life; I refer to the current tendency to avoid work. Everyone has to have an executive assistant to do the work. Physicians no longer want to take care of patients but simply issue

the old policy where officers in many of the specialties could receive D prefix 6 months after residency training. Likewise, officers without formal training will now require, for all specialties, 18 months of duty limited to the professional field instead of the 12 months formerly required for many specialties. One exception to this criterion is the award of certain secondary sub-specialty classifications to officers already qualified as A, B, or C internists or surgeons.

Group C prefix will now be awarded only to officers who have recently completed the formal training required to meet the American Board requirements for certification; whereas, in the past officers have been awarded a C prefix after completion of 2 years' residency training. This will mean that now an officer will not receive his C prefix until after completion of 3 years of formal training in the major specialties. Likewise, officers without the formal training required must have professional duty or practice limited to the professional field for a minimum of 5 years for all specialties prior to the award of C prefix. In the past this required period has varied from 3 to 5, 4 to 6, or 5 to 9 years, depending on the specialty involved. Again exceptions are made in regard to the award of a C prefix in secondary subspecialties for officers already qualified as A, B, and C internists or surgeons.

Group B prefix, in the future, will indicate that the officer has been certified by the American Specialty Board for his particular classification. Officers who have been awarded the B prefix without a board certification will continue to retain this prefix designation as long as their performance of duty indicates continued ability to function in the specialty without professional supervision.

Group X.—For the first time a new prefix appears in the medical officer classification policy. This prefix is an indication that the officer to whom it is awarded has qualifications in research that are associated with the specialty field identified by his MOS. The need for some specific designation of officers qualified or trained in research has been recognized by this office for a considerable period. An attempt has been made to establish a specific MOS for this type of officer but technical difficulties and other problems have precluded such an MOS being established. In lieu thereof, the Surgeon General's Office was authorized to use the prefix system to designate an officer qualified or engaged in research. This has been done now by the establishment of the prefix X.

The new classification policy also defines for the first time the prefix designation identifying the degree of proficiency for the Radiological Defense Officer (3004). Although the same prefixes X, A, B, C, and D are authorized in connection with this MOS, the definition and

criteria under which these prefixes are awarded are quite different from those used in connection with other professional MOS's. This difference must be kept in mind when considering the qualifications and degree of experience of medical officers with MOS 3004.

Medical Officer, General Duty (3100) is a basic MOS. It indicates that an officer is qualified to perform various medical functions in a hospital, dispensary, field unit, or other military installation, rather than being limited to one particular field. In addition, it is used to designate the primary classification of officers assigned to duty as interns in either civilian or military hospitals. The alphabetical prefix denoting the degree of proficiency will not be used in connection with MOS 3100.

It is believed that this new change in policy will result in a more efficient classification and utilization of medical officers.



**CLINICAL USES OF INTRAVENOUS PROCAINE**, by David J. Graubard M. D., *Assistant Visiting Surgeon, Cumberland Hospital, Assistant Visiting Orthopedist, Kingston Avenue Hospital, Brooklyn, N. Y.; formerly Assistant Surgeon, Reconstruction Hospital Unit, New York Post-Graduate Medical School and Hospital, N. Y., and Milton C. Peterson, M. D., Visiting Anesthesiologist, Research Hospital, Kansas City, Mo., formerly Anesthesiologist, New York Post-Graduate Medical School and Hospital, Associate Professor of Anesthesia New York Post Graduate Medical School, N. Y.* Publication Number 73, American Lecture Series. 104 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

**THE MERCK MANUAL of Diagnosis and Therapy**, a Source of Ready Reference for the Physician. 8th edition. 1592 pages. Merck & Co., Inc., Rahway, N. J., publishers, 1950. Price \$5.

**LIGHT THERAPY** by Richard Kovacs M. D., *Professor of Physical Medicine, New York Polyclinic Medical School and Hospital*. Publication Number 57, American Lecture Series. 112 pages, illustrated. Charles C. Thomas Publisher, Springfield, Ill., 1950. Price \$2.25.

**THE DIAGNOSIS OF SALMONELLA TYPES**, by F. Kauffmann, M. D., *Chief, International Salmonella Center, State Serum Institute, Copenhagen, Denmark*. Publication Number 62, American Lecture Series. 86 pages. Charles C. Thomas Publisher, Springfield, Ill., 1950. Price \$2.25.

**MODERN PRACTICE IN DERMATOLOGY** edited by G. B. Mitchell-Heggs O. B. F. M. D., F. R. C. P. *Physician in Charge, Skin Department, St. Mary's Hospital and Medical School, London*. Physician, St. John's Hospital for Diseases of the Skin and Institute of Dermatology University of London. Member Advisory Panel on Dermatitis, Ministry of Labour and National Service. 836 pages illustrated. Paul B. Hoeber, Inc., New York, N. Y., publisher 1950. Price \$12.50.

**MEDICAL DIAGNOSIS Applied Physical Diagnosis** edited by Roscoe L. Pullen M. D., F. A. C. P. *Professor of Graduate Medicine, Director of the Division of Graduate Medicine, and Vice Dean of the School of Medicine, Tulane University of Louisiana; Senior Visiting Physician, Charity Hospital of Louisiana at New Orleans. Consultant in Medicine, Veterans' Administration Hospital, New Orleans, La. Consultant to the Surgeon General, Department of the Army, Washington, D. C.* 2d edition. 1119 pages, illustrated with 601 figures. 48 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$12.50.

**CLINICAL ELECTROCARDIOGRAPHY**, by Francis F. Rosenbaum, M. D., *Assistant Clinical Professor of Medicine, Marquette University School of Medicine, Staff, Milwaukee County Hospital, Associate Staff, Columbia Hospital, Adjunct Staff, Milwaukee Children's Hospital, Cardiac Consultant and Attendant, Cardiac Clinic, Milwaukee Children's Hospital, Milwaukee Wis.* Edited by Henry A. Christian, A. M. M. D., LL. D. Sc. D. (Hon.) M. A. C. P., Hon. F. R. C. P. (Can.) D. S. M. (A. M. A.). *Hercy Professor of the Theory and Practice of Physic Emeritus, Harvard University. Sometime Clinical Professor of Medicine, Tufts College Medical School, Sometime Visiting Physician, Beth Israel Hospital, Sometime Physician in Chief, Carney Hospital. Physician in Chief Emeritus, Peter Bent Brigham Hospital, Boston, Mass.* (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work.) 265 pages illustrated. Oxford University Press, New York, N. Y. publishers 1950. Price \$4.50.

**MODERN TRENDS IN ORTHOPAEDICS**, edited by Sir Harry Platt M. C., M. S. F. R. C. S., *Professor of Orthopaedic Surgery, University of Manchester, Consultant Adviser in Orthopaedics to the Ministry of Health. President Société Internationale de Chirurgie Orthopédique et de Traumatologie*. 497 pages, illustrated. Paul B. Hoeber Inc., New York, N. Y., publisher 1950. Price \$35.

**NUTRITION AND DIET THERAPY**, by FAIRFAX T. Proudfit, *formerly Instructor in Nutrition and Diet Therapy, University of Tennessee College of Medicine and Tennessee School of Nursing, Director of Dietary Department, John Gaston Hospital, Memphis Tenn. and Corinne Hazden Robinson, Lecturer in Nutrition and Dietetics, Temple University School of Medicine, Philadelphia formerly Instructor in Nutrition and Diet Therapy, Columbia University School of Nursing*. 10th edition. 970 pages illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$4.

**THE PHARMACOPEIA OF THE UNITED STATES OF AMERICA** (*The United States Pharmacopeia*), Fourteenth Revision (U. S. P. XIV) and *The First U. S. P. National Formulary*. By authority of the United States Pharmacopoeial Convention meeting at Washington, D. C., May 14 and 15 1940. Prepared for the Convention of Revision and Published by the Board of Trustees. Official from November 1, 1950. 1066 pages. Mack Publishing Company, Easton, Pa., publishers. Price \$9.

**MARRIAGE IS WHAT YOU MAKE IT**, by Paul Popenoe, Sc. D., *General Director, The American Institute of Family Relations, Los Angeles, Calif.* 224 pages. The McGraw-Hill Company, New York, N. Y., publishers, 1950. Price \$3.

**THE CEREBRAL CORTEX OF MAN**, A Clinical Study of Localization of Function, by Willis D. Penfield, C. M. G., M. D. (Johns Hopkins), B. Sc., and D. Sc. (Oxon.), Hon. F. R. C. S. (Lond.), F. R. S., *Professor of Neurology and Neurosurgery, McGill University; Director, Montreal Neurological Institute, and Theodore Rasmussen, M. D., Professor of Neurological Surgery, The University of Chicago, formerly, Lecturer in Neurosurgery, McGill University, Assistant Surgeon, Montreal Neurological Institute.* 248 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$6.50.

**MANAGEMENT OF PERIPHERAL ARTERIAL DISEASES**, by Saul S. Samuels, A. M., M. D., *Chief of the Department of Arterial Diseases, Stuyvesant Polyclinic Hospital, New York, Consulting Vascular Surgeon, Long Beach Hospital, Long Beach, N. Y., Director and Attending Angiologist, Brooklyn Hebrew Home and Hospital for Aged, Brooklyn, N. Y.; Fellow in Surgery, New York Academy of Medicine; Member of Committee on Surgery, New York Diabetes Association, Editor-in-Chief, "Angiology", President, Angiology Research Foundation.* 345 pages; illustrated. Revised and enlarged from *The Diagnosis and Treatment of Diseases of the Peripheral Arteries*. Oxford University Press, New York, N. Y., publishers, 1950. Price \$7.50.

**MEDICAL PARASITOLOGY**, for Medical Students and Practicing Physicians, by William G. Swartz, M. D., *Associate Professor of Parasitology, Associate in Medicine, The Jefferson Medical College of Philadelphia; Special Consultant, U. S. Public Health Service, Communicable Disease Center, Atlanta, Ga.* 296 pages; illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1950. Price \$4.25.

**ORAL AND FACIAL CANCER**, by Bernard G. Sarnat, M. D., F. A. C. S., *Professor and Head of the Department of Oral and Maxillofacial Surgery, College of Dentistry, and Clinical Assistant Professor of Surgery, College of Medicine and Research and Education, University of Illinois at Chicago.* 300 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$6.

**LIPPINCOTT'S QUICK REFERENCE BOOK FOR NURSES**, by Helen Young, R. N., *Director of Nursing, Emerita, Columbia Presbyterian Medical Center, Editorial Board, Department of Nursing, Faculty of Medicine, Columbia University, Presbyterian Hospital School of Nursing, New York; Mary Elizabeth Allanach, A. M., R. N., Assistant Professor of Nursing, Elizabeth S. Gill, B. S., R. N., Instructor in Nursing; Eleanor Lee, A. B., R. N., Assistant Professor of Nursing; G. Harriet Mintel, A. M., R. N., Instructor in Nursing, Helen P. Pettit, B. S., R. N., Assistant Professor of Nursing.* 6th edition. 626 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$3.

**WORLD SURGERY, 1950**, by Stephen A. Ziehlman, M. A., M. D., F. A. C. S., F. I. C. S., *Abstract and News Editor, Journal of the International College of Surgeons, Abstractor for International Abstracts of Surgery and Surgery, Gynecology and Obstetrics, formerly Assistant Chief, Division of Publications, Bureau of Medicine and Surgery, U. S. Navy, and Assistant Editor, U. S. Naval Medical Bulletin.* 177 pages; 57 illustrations. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$6.



## BOOK REVIEWS

**SIMMONDS' DISEASE** *Extreme Insufficiency of the Adenohypophysis* by R. F. Farquharson M. B. F. R. C. P. (C) *Professor of Medicine and Head of the Department, University of Toronto, Physician in Chief Toronto General Hospital Toronto Canada* Publication Number 34 American Lecture Series 91 pages illustrated Charles C. Thomas Publisher Springfield Ill. 1950 Price \$2

The book is one of the American Lecture Series and is an excellent presentation of the pathology, pathogenesis, clinical picture, and diagnosis of Simmonds' disease. The presence of the syndrome is discussed as occurring only when there is destruction of the pituitary gland. The destructive lesion is caused by one of the following conditions: ischemic necrosis, fibrosis, tumor, or granuloma. Each of these is well described. The lack of mention of ACTH, one of the recent greatest medical discoveries, as applied to the treatment and physiology of the pituitary gland, is a serious omission. Although the relation of the pituitary gland to the other endocrine glands is discussed, the more recent physiologic knowledge of this relationship is omitted. There are many references throughout the text and an excellent bibliography at the end. The book would be read with profit by the general medical man, the obstetrician, and with interest by the endocrinologist. It is a comprehensive study of the syndrome—*Commander H. A. Lyons (MC) U. S. A.*

**TEXTBOOK OF BACTERIOLOGY** by Joseph M. Dougherty, A. B., M. A., Ph. D., *Dean of the School of Science and Professor of Bacteriology, Villanova College, Fellow of the American Association for the Advancement of Science, and Anthony J. Lambert, B. S., M. S., Instructor in Bacteriology and Parasitology, Temple University School of Medicine, formerly Instructor in Bacteriology, Villanova College. Member of the American Public Health Association.* 2d edition 491 pages illustrated C. V. Mosby Co. St. Louis Mo., publisher, 1950 Price \$3.75

The authors believe that many of the available textbooks of bacteriology are too extensive for undergraduates. Although the need for less comprehensive coverage is admitted, a brief account, if it is to be adequate, requires wisdom and mastery in selection and presentation, perhaps to a greater degree than is necessary for more complete texts. This book contains an abbreviated survey of all aspects of medical microbiology, but these are too superficially treated, and some sections are antiquated. Examples are found in the discussion of the relation of "precipitins" to "agglutinins," and of the value of serum therapy in meningococcal infections. An excellent opportunity to demonstrate the principles and use of antigenic analysis is neglected in the section on *Salmonella*. Reference to antigenic differences in the *Shigella* group is omitted entirely. For the purpose intended, the reviewer believes that thorough study of illustrative parts of a good textbook, under able direction, would supply a sturdier foundation than the use of an almost equally expensive but superficial survey, such as the text under consideration—*Lt. Col. L. R. Kohn, MSC, U. S. A.*

CURRENT  
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H "

mann, Cyrus C. Sturgis, Robert H. Williams. 736 pages. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$10.

This book is an excellent treatise on modern current therapy from the point of view of practicing physicians who tell in a clear, concise manner the procedures they recommend for the treatment of various diseases which are based on the results obtained from their own private practice. The obsolete methods contained in the 1949 volume have been deleted; valuable information in the 1949 edition has been repeated, and all the new and practical treatments have been added. The contents of the book have been divided into 15 sections which cover the diseases in the following categories: (a) infections; (b) respiratory system; (c) cardiovascular system; (d) blood and spleen; (e) digestive system; (f) metabolism and nutrition; (g) endocrine system; (h) urogenital tract; (i) venereal diseases; (j) skin; (k) allergy; (l) nervous system; (m) locomotion; (n) obstetric and gynecologic conditions; and (o) physical and chemical agents.

The changes in the treatment of the various diseases by chemotherapeutic advances may be illustrated by referring to the chapter on the modern prevention and treatment of malaria where new drugs have almost entirely replaced the old stand-by, quinine. To those who wish to criticize or take issue with certain recommendations made by the authors as to the best therapy available for the treatment of certain diseases there is room for argument; for example, the use of electro-shock therapy in manic depression and schizophrenia. The book is well written, well bound, and printed in an easy-to-read bold type on paper of excellent quality. The index is complete—which often saves valuable time when quick reference is necessary. It is highly recommended to the student and practicing physician, both of whom are interested in keeping current with the best in practical therapy.—*Capt. C. R. Ball (MC) U. S. N.*

*OFFICE ORTHOPEDICS*, by Lewis Cozen, M. D., F. A. C. S. *Attending Orthopedic Staff, The Orthopedic Hospital, Veterans' Hospital, Los Angeles County Hospital, Cedars of Lebanon Hospital, Los Angeles, and Los Angeles Tuberculosis Sanitarium, Monrovia, Calif.; Assistant Professor of Orthopedic Surgery, College of Medical Evangelists, Los Angeles.* 252 pages, 156 illustrations. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$5.

This little book fills a gap which exists in the orthopedic information available to the student and general practitioner. It furnishes practical information on orthopedic subjects that will come as an invaluable aid to those who are called on to treat minor orthopedic conditions and to recognize major orthopedic lesions in general practice, especially in outlying communities. Many of these minor conditions are all too briefly dismissed in standard orthopedic texts.

The outstanding quality of the book is the detail given to the procedures that can easily be carried out in the office, such as the treatment of minor fractures and foot complaints. Materials, specifications for simple apparatus, and directions for their use are carefully described. The section dealing with symptom diagnosis is especially useful. The author is careful to state in his preface that "at least one complete standard work on orthopedic surgery should be available to the physician who uses this volume." When discussing the types of lesion that are suitable for treatment in office practice he usually states specific limitations and the reader is warned, at least by inference, of those which are not. The impression is also given, fortunately, that many of the conditions are beyond the scope of the general practitioner.

The work covers briefly, and often by mere mention, so many diverse orthopedic and related conditions that it suffers from over-simplification. It is also questionable whether the treatment (not the recognition) of clubfoot should come in the realm of the general practitioner. Certainly the technique of

cervical and lumbar sympathetic block should not be encouraged as office practice for the uninitiated. In spite of the fact that the author has felt compelled to run the gamut of orthopedic diagnoses from arthrodystrophia to Waldenström's disease, the material is well presented and the precautions clearly stated. The book is recommended as a useful reference for the general practitioner who must carry out some orthopedic office procedures.—*Col. F. A. Bray, MC U S A*

**THE PATHOLOGY OF ARTICULAR AND SPINAL DISEASES** by Douglas H. Collins, O. B. E., M. D. (Liverpool). *Reader in Clinical Pathology in the University of Leeds; formerly Rheumatism Research Fellow in the University of Leeds; E. H. S. Pathologist and Medical Superintendent, Wharfedale Hospital, Sheffield; Junior Lecturer and Holt Fellow in Pathology in the University of Liverpool.* 331 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md. publishers 1950. Price \$7.

This textbook provides an up-to-date and well illustrated account of the morbid anatomy of the joints and spine. The introductory chapters deal primarily with the anatomy and physiology of the joint tissues and bone. The following 15 chapters discuss the diseases of joints and the spine in a conventional pathologic sequence. An attempt is made to relate and compare the various diseases and orient them within the framework of general pathology. The illustrations, which are all original, are exceptionally good. They have been prepared from post-mortem material with only an occasional radiograph to demonstrate certain unusual features. To quote the author: "Few practitioners have had the opportunity of studying these diseases in the post-mortem room or in the histological laboratory and much of their knowledge of the pathological processes involved is founded on radiology which is only the shadow without the substance of morbid anatomy."

Tumors of bone receive only brief mention—which seems regrettable in a text of this nature. Disorders of bone other than those directly affecting joints are reviewed in chapter 3 in summary form. The book should appeal not only to the pathologists but to orthopedists and radiologists as well.—*Commander K. P. Knudtson (MC) U S A*

**COMMUNICABLE DISEASES** edited by Rosewo L. Pullen, A. B., M. D., F. A. C. P., *Professor of Graduate Medicine, Director of the Division of Graduate Medicine, and Vice Dean of the School of Medicine, Tulane University of Louisiana; Senior Visiting Physician, Charity Hospital of Louisiana at New Orleans; Consultant in Medicine, Veterans Administration Hospital, New Orleans; La. Consultant to the Surgeon General, Department of the Army, Washington, D. C.* 1975 pages, illustrated. Lea & Febiger, Philadelphia, Pa. publisher 1950. Price \$20.

This new book is a compilation of articles written by 53 contributors most of whom are or have been associated with Charity Hospital of Louisiana at New Orleans. As such, it reflects largely the experience and practice in communicable disease management at that institution. Although of value as a textbook, this work was produced chiefly to aid the clinician in recognizing and managing communicable illnesses, particularly in the earliest stages. For this reason the arrangement of contents is unconventional in that the communicable diseases are grouped according to predominant manifestations. Although subject to pedagogic criticism, this manner of organization increases the value of the book as a clinical reference. This quality is further enhanced by the inclusion of numerous tables pertaining to diagnostic criteria and treatment which may be easily and rapidly consulted by the busy clinician. On the other hand, each topic is presented in traditional textbook form for ease in reading. The illustrations are adequate and the reproductions are excellent. In general the subjects are well covered and include references to some of the most recent literature. Some exceptions are remarkable, however. For instance, the roles of DDT, benzyl

benzoate, and undecylenic acid in treating pediculosis, scabies, and dermatophytosis, respectively, are de-emphasized in favor of the older types of treatment. This seems unjustifiable in view of the military medical experience with these compounds. Similarly the article on rheumatic fever fails to mention the use of penicillin as a prophylactic by persons who have had the disease. Under epidemic diarrhea of the newborn the replacement of fluids and electrolytes is not sufficiently stressed or described in adequate detail. Aside from these deficiencies, the text is reasonably up to date, particularly with regard to the field of antibiotic therapy. The book is recommended for reference use in all military hospitals and large dispensaries—*Maj C M. Pierhart, MC, U S A*

**ADVANCES IN INTERNAL MEDICINE, Volume 3.** Edited by William Dock, M. D., *Long Island College of Medicine, Brooklyn, N Y.*, and I. Snapper, M. D., *The Mount Sinai Hospital, New York, N Y.* 478 pages, illustrated. Interscience Publishers, Inc., New York, N Y., publishers, 1949. Price \$8.50

This third volume in a series devoted to advances in internal medicine is intended to present current information and concepts of importance within that field. Such a book, as the editors were well aware, becomes dated almost as soon as it is off the press. However, such an objection is ameliorated by the quality of the presentation. It will undoubtedly remain an informative volume until the next edition is ready for release. The presentation is not as an abstract or digest of current literature, but rather a series of articles on subjects of current interest. There is no attempt at continuity of subject presentation. This volume reviews the use of British anti-lewisite, the hemolytic anemias, factors modifying the therapeutic activity of penicillin, streptomycin, histoplasmosis, antithyroid compounds, diagnosis by enzymic methods, plasma fractionation, heat acclimatization, and new therapeutic agents in neurologic conditions.

The list of contributors is impressive; their contributions equally so. The subjects are covered concisely and completely. There is no "rehash" of old or readily available material. Complete bibliographies are appended. An objection might be made to the lack of organization in regard to subject presentation, but this is a minor consideration. The book is cloth bound, the printing and illustrations are of good quality. This volume is most highly recommended, especially for the physician too busy or too far separated from medical library facilities to avail himself of current medical literature—*Lieutenant Commander A. R. Eyrion (MC) U. S. N.*

**QUINIDINE IN DISORDERS OF THE HEART,** by Harry Gold, M. D., *Professor of Clinical Pharmacology at Cornell University Medical College; Attending-in-Charge of the Cardiovascular Research Unit at the Beth Israel Hospital; Attending Cardiologist at the Hospital for Joint Diseases; Managing Editor of the Cornell Conference on Therapy.* 115 pages. Paul B Hoeber, Inc., New York, N Y., publisher, 1950. Price \$2.

This small monograph provides the clinician with practically all he needs to know concerning the use of quinidine in the treatment and prevention of disorders of the heart beat. Dr. Gold has drawn on his wide clinical and experimental knowledge to write a practical manual that will prove invaluable to the internist and the general practitioner alike. The indications, therapeutic actions, toxic actions, absorption, and elimination of quinidine are adequately described. There is a detailed plan for an effective yet safe dosage schedule. A regimen for intravenous administration, particularly in the control of ventricular tachycardia, is presented at great length. The use of quinidine in each of the ectopic rhythms is described. Whenever the author believes that digitalis is the drug of choice in treating an arrhythmia, he so states. In an excellent chapter on the combined use of quinidine and digitalis he discusses this controversial subject

general principles of dietotherapy. The importance of nutrition in preventive medicine is brought out in chapters on nutrition in public health practice and in industrial medicine. Under this latter heading the authors discuss the nutrient requirements in relation to physical efficiency under various forms of stress.

The appendix contains tables useful for formulating therapeutic diets and in making nutritional evaluations of dietaries. This book is of great interest not only to clinicians but to workers in the field of nutrition and public health.—*Maj C. J. Kocher, MSc, U. S. A.*

**NUTRITION AND DIET THERAPY**, by Fairfax T. Proudfoot, *formerly Instructor in Nutrition and Diet Therapy University of Tennessee College of Medicine and Tennessee School of Nursing, Director of Dietary Department, John Gaston Hospital, Memphis, Tennessee; and Corinne Hopden Robinson, Lecturer in Nutrition and Dietetics, Temple University School of Medicine Philadelphia formerly Instructor in Nutrition and Diet Therapy Columbia University School of Nursing* 10th edition, 270 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1930. Price \$4

This text, basically for the teaching of student nurses, is also a valuable reference book for anyone interested in diet in health and disease. Separate sections cover normal nutrition; nutrition in such conditions as pregnancy, lactation, and childhood; diet in disease; and elementary cookery. Of special value to those working with diets are the complete tables of food values that are found in the appendix. Summary tables of all food elements as well as of digestive processes are included in the text. A separate chapter on diagnostic tests involving diets is a welcome addition not found in most texts of this type. The chapters on diet therapy include the physiologic or pathologic factors underlying the type of diet used. Foods are classified as those to be used and those to be avoided, also in handy tabular form. A basic diet and sample menu is provided for each special diet. The section on fundamental cookery should be extremely useful for those preparing special diets in the home.—*Lt. H. M. E. Linnenbruegge (AC) U. S. N.*





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the following publications:*

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Vol. X, Letter M (first half). Author and  
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**COVER PHOTOGRAPH**

*Hospital Corpsman signals a helicopter  
pick up a wounded man for evacuation  
to a hospital.*

## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25 D. C.

MEMO: Personnel of the Medical Services, The United States Armed Forces.

From the time the Office of Medical Services was established a year and a half ago, continual stress has been placed on the mission of the military medical services in support of the combatant arms. A year ago this month, the Secretary of Defense issued a directive to the Secretaries of the Army, Navy, and Air Force calling their attention to this mission and to the urgent need for scaling the organization to this end.

In June 1950 the full meaning of this mission became suddenly quite clear when United States forces were committed in support of the United Nations' decision to undertake armed police action in Korea. The request of the Far Eastern commander for additional forces entailed the prompt assignment of several hundred medical officers at various points in support of the new operations. These medical officers were available when needed.

This orientation of the military medical services to meet their primary mission which is in support of the combatant arms will prepare us for any development which the Armed Forces and the nation may encounter.

*Richard L. Meiling*

Richard L. Meiling, M.D.  
Director of Medical Services



# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published monthly by the Department of Defense*

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THE PRINTING OF THIS PUBLICATION HAS BEEN APPROVED BY THE DIRECTOR OF THE BUREAU OF THE BUDGET, OCTOBER 19, 1949

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## Detection of Early Carcinoma of the Uterus

SARKIS S. SARKISIAN, *Lieutenant (MC) U. S. N.*<sup>1</sup>

PAPANICOLAOU and Traut (1), Meigs et al. (2), Ayer (3), Graham and Meigs (4), Gates and Warren (5) and others have already indicated the value of the smear examination for malignant cells. At the U. S. Naval Hospital, San Diego, Calif., the technique for mass evaluation of exfoliative cytology as compared with biopsy in early carcinoma of the cervix was undertaken in June 1948 by the Department of Pathology in cooperation with the Department of Obstetrics and Gynecology.

This is a report of 3,420 cases examined from October 1948 through December 1949; included are 1,500 cases (examined during the period October 1948 through June 1949) previously reported (6).

### METHODS

When the appearance of a smear is suggestive of cancer, a specimen of tissue from the cervix at four opposed points is obtained for biopsy. If the biopsy is negative or if it reveals carcinoma, a 360° cone is obtained by sharp dissection; cautery is not used in order to procure a satisfactory histologic preparation. The tissue is then subjected to complete serial sectioning and microscopic examination. Thus an accurate representation of the actual pathologic changes is

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<sup>1</sup> U. S. Naval Hospital, San Diego, Calif.

obtained and we are then in a position to state with a fair degree of accuracy whether the cancer is preinvasive or invasive. In the invasive carcinomas a smear is examined each week for the first month during and after irradiation; after that a smear is examined each month. If malignant cells continue to desquamate 6 months post-therapeutically, a specimen for biopsy is obtained which, if possible, is a 360° cone of the cervix. This method of follow-up of cervical carcinomas will detect radio-resistant cancer requiring surgical intervention—a modified Wertheim procedure.

### FINDINGS AND RESULTS

In the 3,420 patients examined, 42 (1.23 percent) cancers were confirmed by biopsy. Forty-one (1.19 percent) were squamous cell carcinoma of the cervix uteri—30 (0.87 percent) were preinvasive carcinomas of the cervix, and 11 (0.33 percent) were invasive carcinomas. There was 1 (0.03 percent) adenocarcinoma of the endometrium. In an additional 40 patients biopsy has not been completed. The statistics will be revised as information is gathered concerning these cases. Of the 3,420 cases, 17 (0.50 percent) were reported as suspicious of cancer on cervical smear but subsequent biopsy proved that the lesion was benign.

Thus far, of the 22 uteri removed incident to treatment for preinvasive squamous cell carcinoma of the cervix, 15 (68.2 percent) show no histologically demonstrable carcinoma after serial section of the distal 2.5 cm. of the cervix uteri; in 7 (31.8 percent) uteri preinvasive squamous cell carcinoma was noted.

Table 1 lists 42 cases of cancer. In some cases photomicrographs of histologic sections that are representative of the group as a whole are shown to depict the cytologic and histologic criteria on which a diagnosis of cancer is based.

Figure 1 depicts the incidence of carcinoma of the cervix uteri in

TABLE 1

Case number	Smear number	Age (years)	Diagnosis as confirmed by biopsy
1	P18-49	37	Preinvasive carcinoma
2	P129-45	36	Ido
3	P174-45	35	Ido
4	P196-49	40	Invasive carcinoma.
5	P398-49	44	Ido
6	P479-49	26	Preinvasive carcinoma.
7	P494-49	30	Ido
8	P534-49	35	Ido
9	P579-49	21	Invasive carcinoma
10	P617-49	44	Ido
11	P648-49	29	Preinvasive carcinoma
12	P654-49	23	Ido
13	P687-49	24	Ido
14	P748-49	26	Ido
15	P828-49	30	Ido
16	P888-49	39	Invasive carcinoma.
17	P901-49	40	Preinvasive carcinoma
18	P909-49	25	Ido
19	P1006-49	69	Invasive carcinoma.

TABLE I—Continued

Case number	Smear number	Age (years)	Diagnosis as confirmed by biopsy
20	P1114-49.....	28	Preinvasive carcinoma.
21	P1183-49.....	34	Invasive carcinoma.
22	P1175-49.....	27	Preinvasive carcinoma.
23	P1222-49.....	38	Invasive carcinoma.
24	P1211-49.....	28	Preinvasive carcinoma.
25	P1260-49.....	22	Do.
26	P1305-49.....	47	Do.
27	P1350-49.....	34	Do.
28	P1353-49.....	25	Do.
29	P1447-49.....	22	Do.
30	P1501-49.....	30	Do.
31	P1530-49.....	32	Invasive carcinoma.
32	P1544-49.....	35	Preinvasive carcinoma.
33	P1715-49.....	32	Do.
34	P1827-49.....	56	Invasive carcinoma.
35	P1869-49.....	29	Preinvasive carcinoma.
36	P1953-49.....	22	Do.
37	P2153-49.....	71	Invasive endometrial carcinoma.
38	P2315-49.....	41	Preinvasive carcinoma.
39	P2326-49.....	36	Do.
40	P2481-49.....	34	Do.
41	P2494-49.....	41	Do.
42	P2535-49.....	36	Do.

<sup>1</sup> Denotes cases with photomicrographs appended.

the various age groups represented. The age group of patients seen at this hospital lies in the 21- to 30-year bracket; approximately 30 percent of the women are in the menopausal age group. Therefore, there is an overemphasis of values in the younger age group in this study.

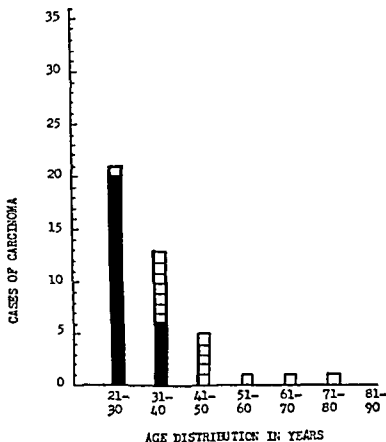


Figure 1.—White area represents the number of cases of invasive carcinoma; the black area represents preinvasive carcinoma.





A



B



Figure 2.—Case 8, listed in table 1 (A) Papanicolaou smear. (B) Tissue biopsy. (C) Tissue biopsy.

#### DISCUSSION

The cytologic method for diagnosis of carcinoma is not new. The pathologist has been making a diagnosis of cancer on cell block preparations of fluids from the abdomen, chest, and urinary tract for years; however, he looked for islands or groups of cells in making a diagnosis of carcinoma. Papanicolaou spearheaded the objective of examining the individual cell for diagnostic features of malignancy.



A



B



C

Figure 3.—Case 18, listed in table 1.  
(A) Papanicolaou smear. (B) Tissue biopsy. (C) Tissue biopsy.

In 1929, MacCarty (7), and later Guttman and Halpern (8), called attention to the changes in the nucleolus of the cell as an aid in the diagnosis of malignancy; however, the latter pointed out the inaccuracy of depending on this change alone. Hauptmann (9) has described the cytologic features of malignant cells and classified them into five basic types. Peters (10), Fremont-Smith et al. (11), Wiles and Hellwig (12), Scheffey et al. (13), Lombard et al. (14), and others have pointed out the value of the cytologic smear examina-

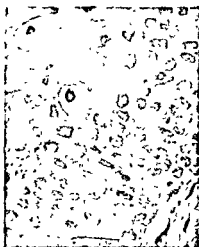


A

Figure 4—Case 3, listed in table 1. (A) Papanicolaou smear. (B) Tissue biopsy. (C) Tissue biopsy.



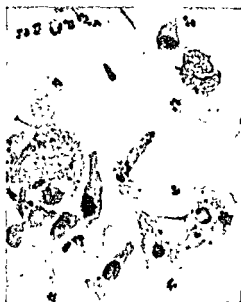
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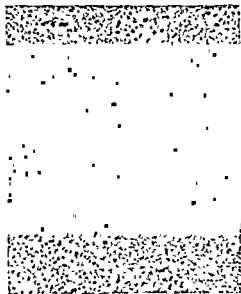
C

tion for the detection of cancer. The salient features of a malignant cell are based upon a comparison of the cell with a normal-type cell of the tissues de-quamating these cells. There are certain basic features present—these are demonstrated by the photomicrographs of malignant cells shown in figures 2A, 3A, 4A, 5A, 6A, and 7A. In the malignant cell there are hyperchromatic nuclei with coarse chromatin clumps and irregular nuclear borders; the nuclear-cytoplasmic ratio is generally greatly decreased, i. e., the larger the nucleus, the greater is the likelihood of malignancy. Occasionally, multinucleated cells are seen (figures 4A, 5A, 6A, and 7A). Thus, the morphology of the

Figure 5.—Case 28, listed in table 1.  
 (A) Papanicolaou smear. (B) Tissue biopsy.  
 (C) Tissue biopsy.



A



B



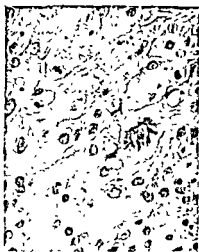
C

individual cell is as important in determining the presence of cancer as is the architectural pattern of a tissue, and it is almost as reliable. Figure 2B demonstrates the architectural pattern of preinvasive carcinoma in immediate proximity to benign squamous epithelium. Figure 5B is a totally bizarre architectural pattern of invasive carcinoma.

By examining the photomicrographs of the Papanicolaou smear and comparing the malignant cells with the respective tissue biopsy, one can identify the source of the cells. The source of the malignant cells in the smear can be observed in figures 6A, 6B, 7A, and 7B. Once



A

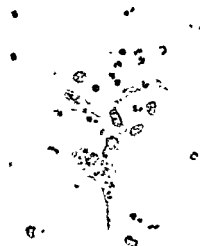


B

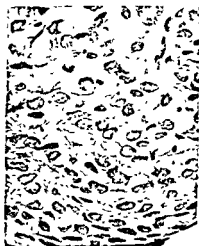
Figure 6—Case 14, listed in table 1. (A) Papanicolaou smear. (B) Tissue biopsy.

the pathologist is acquainted with the cytologic variations of the normal desquamated cell, the presence of malignant changes can readily be detected.

In the examination of 22 uteri which were surgically removed incident to treatment for preinvasive squamous cell carcinoma of the cervix, 68.2 percent revealed no cancer. Does this mean that carci-



A



B

Figure 1.—Case 6, listed in table 1. (A) Papanicolaou smear. (B) Tissue biopsy.

noma of this type can be removed by a 360° conization of the cervix? It would appear, in the light of our present knowledge, that this does not constitute adequate treatment of carcinoma in situ.

Younge et al. (15) states: "If the carcinoma in situ involves only the surface epithelium and does not involve the cervical glands, thorough destruction of the surface lesion by cauterization or complete excision by sharp conization will apparently cure 85 percent of such cases." This is a very brave stand; but, until more is known about this disease, hysterectomy is the treatment of choice regardless of the age of the patient.

The foregoing indicates the highly specialized and controversial field we are dealing with and by virtue of this, it is believed that the cytologic smear methods for diagnosis of malignancy should be left to the highly trained pathologists in well-equipped laboratories where proper evaluation can be made. Jeopardy to the patient or embarrassment to the physician can then be obviated. Novak (16) states " \* \* \* the chief workshop for this purpose should for the present be well-organized and well-equipped clinics."

#### SUMMARY

Of 3,420 patients screened cytologically 42 or 1.23 percent showed cancer. In 17 (0.50 percent) a false positive was reported. Of 22 uteri examined after surgical removal incident to treatment for pre-invasive squamous cell carcinoma, 15 (68.2 percent) showed no histologic evidence of cancer.

A diagnosis of preinvasive squamous cell carcinoma of the cervix should not be made until a 360° cone of the cervix is subjected to serial examination.

The Papanicolaou-Traut stain of a cervical smear is of definite value in the detection of early carcinoma of the uterine cervix.

#### REFERENCES

1. PAPANICOLAOU, G. N., and TRAUT, H. F.: Diagnostic value of vaginal smears in carcinoma of uterus. *Am. J. Obst. & Gynec.* 42: 193-206, Aug. 1941.
2. MEIGS, J. V.; GRAHAM, R.; FREMONT-SMITH, M.; JANZEN, L. T.; and NELSON, G. B.: Value of vaginal smear in diagnosis of uterine cancer; report of 1,015 cases. *Surg. Gynec. & Obst.* 81: 337-345, Oct. 1945.
3. AYER, J. E.: Cervical cytology. *J. A. M. A.* 136: 513-516, Feb. 21, 1948.
4. GRAHAM, R. M., and MEIGS, J. V.: The value of the vaginal smear. *Am. J. Obst. & Gynec.* 58: 847-850, Nov. 1949.
5. GATES, O., and WARREN, S.: *A Handbook for the Diagnosis of Cancer of the Uterus by the Use of Vaginal Smears.* Harvard Univ. Press, Cambridge, Mass., 1947.

- 6 SARKISIAN, S. S. ; Early detection of carcinoma of cervix uteri. U. S. Armed Forces Medical Journal (In press.)
- 7 MAC CARTY, W. C. . Malignant cell. *J. Cancer Research* 13: 167-172 July 1929
8. GUTTMAN, P. H., and HALPERN, S. . Nuclear-nucleolar volume ratio in cancer. *Am. J. Cancer* 25: 802-806, Dec. 1935
9. HAUPTMANN, E. . Cytologic features of carcinomas as studied by direct smears. *Am. J. Path.* 24: 1199-1223, Nov. 1948
10. PETERS, H. . The vaginal smear; the ease and difficulty of its evaluation. *Cancer* 2: 615-624, July 1949
11. FREMONT-SMITH, H. , GRAHAM, R. M. ; and MEIGS, J. V. . Early diagnosis of cancer by study of exfoliated cells. *J. A. M. A.* 135: 469-474, Oct. 16, 1948
12. WILES, J. B., and HELLWIG, C. A. . Evaluation of Papanicolaou's method of cancer diagnosis. *Am. J. Clin. Path.* 18: 283-292 Apr. 1948
13. SCHEFFEY, L. C. ; RAKOFF, A. E. , and HOFFMAN, J. . Evaluation of vaginal smear method for diagnosis of uterine cancer. *Am. J. Obst. & Gynec.* 55: 473-480, Mar. 1948
14. LOMBARD, H. L. , MIDDLETON, M. , WARREN, S. , and GATES, O. . Use of the vaginal smear as a screening test. *New England J. Med.* 239: 317-321, Aug. 26, 1948.
15. YOUNG, P. A. , HERTIG, A. T. , and ARMSTRONG, D. . A study of 125 cases of carcinoma in situ of the cervix at the Free Hospital For Women. *Am. J. Obst. & Gynec.* 58: 867-895, Nov. 1949.
16. NOVAK, E. . What constitutes an adequate cancer detection examination of the cervix? with comments on the supplementary value of surface biopsy. *Am. J. Obst. & Gynec.* 58: 851-866, Nov. 1949.



# Treatment of Tinea Capitis With Local Medication

WILLIAM C. MARSH, *Commander (MC) U. S. N.*<sup>1</sup>

**T**REATMENT of ringworm of the scalp (especially when it is caused by *Microsporum audouini*) has always been a problem to physicians treating dependents in out-patient clinics. It was thought for many years that roentgen epilation was necessary for cure. Even when technicians adequately trained in the Kienböck-Adamson technique of roentgen epilation were available, the pediatric or dermatologic follow-up care was not always available. The transient status of patients added to the difficulties. In recent years the work of Schwartz et al. (1), MacKee et al. (2), and Scully et al. (3) in local therapy has given hope that this condition may be treated with local medication on a true out-patient basis.

Thirty-two patients (22 boys and 10 girls) with *M. audouini* infections were treated between December 1948 and August 1949. Of these, 31 were treated with a preparation containing 25 percent zinc undecylenate, 2 percent undecylenic acid, and 5 percent salicylanilide in a carbowax base. Of the 32 patients, 20 had previously received local therapy including 10 percent copper undecylenate ointment; sopronol liquid and ointment; tincture of iodine; 10 percent ammoniated mercury ointment; and 5 percent salicylanilid ointment. None of these medications had been effective although some had been used as long as 3 months.

*Age incidence.*—Fourteen were between 2 and 6 years of age; 15 between 7 and 9 years of age; and 3 from 10 to 11 years of age.

*Epidemiology.*—Twelve patients had siblings who also had ringworm of the scalp.

*Cultural studies.*—All patients were first examined in the clinic with the use of a filtered ultraviolet light. Fluorescent hairs were removed with a fine forceps, coated with eosin in collodion, and planted on Sabouraud's medium. *M. audouini* was obtained in 31 cases and *M. lanosum* in 1 case.

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*Inflammatory response.*—Using the criteria determined by Scully et al. (3), each patient was graded 1-plus to 4-plus. The criteria for grading were used either at the start of treatment or during the course of treatment. Six patients showed a 1-plus reaction; five patients a 2-plus reaction; five patients a 3-plus reaction; and four patients a 4-plus reaction or typical kerion formation (a boggy mass, with deep-seated suppuration and multiple draining sinuses).

In the severe inflammatory cases, alopecia developed, which was feared to be permanent at the time. However, a check of three of the four severe kerion reactions with alopecia revealed that all have had complete regrowth of hair. The fourth case was not observed.

### TREATMENT

Instructions given to the parents on the initial visit to the clinic are of prime importance. The infected areas are pointed out to the parents, and in some cases outlined with gentian violet, parents were given the following instructions: (a) Shave all infected areas, including at least 1 inch of surrounding normal hair. If three or more areas larger than 25-cent pieces were noted, the entire scalp was shaved. (An occasional exception to this rule was allowed in girls.) (b) The applicator was to be made by placing three or four layers of soft cloth over the round head of an old-fashioned type wooden clothespin and securing the cloth with a rubber band. (c) All infected areas were to be rubbed with the ointment 10 minutes, by the clock, twice a day.

The patients were examined under the filtered ultraviolet light at weekly intervals. Manual epilation was not practiced unless all the infected hairs could be removed (if less than 10 fluorescent hairs were present).

A favorable sign is the occurrence of an inflammatory reaction after the institution of treatment. Applications of the ointment were continued unless severe kerion developed; then hot compresses of magnesium sulfate were applied to control the infection. Other factors which indicate a favorable outcome are loosening of the hair and rapid loss of the fluorescent property of the hair (which changes from the original green to a gray color under the ultraviolet light).

Criteria of cure in our series was the absence of any fluorescent hairs for at least 2 months after cessation of treatment and a negative culture on Sabouraud's medium after negative examination under the ultraviolet light 1 month previously.

The results of treatment of *M. audouinii* infections in the series are outlined in table 1.

TABLE 1.—*Results*

Weeks of treatment	Number of cases cured	Percent of total	Weeks of treatment	Number of cases cured	Percent of total
6.....	1	3.2	15 to 17.....	2	6.5
7.....	1	3.2	18 to 20.....	1	3.2
8 to 11.....	15	49.4	Total.....	31	100.0
12 to 14.....	11	35.5			

Scully et al. (3) suggested that, with careful clinical care and follow-up and with the cooperation of parents, most cases of tinea capitis due to *M. audouini* could be cured by local medication. It is believed that the excellent results in this series were due to the medication used and the excellent cooperation of the parents. Over 90 percent of the patients were discharged from treatment as cured in 4 months or less. This period of time compares more than favorably with that required by roentgen epilation and follow-up care.

It is our opinion at this time that the military service could easily adopt this routine for out-patient care of tinea capitis. Furthermore, local medication should be used for a minimum of 3 months before roentgen epilation is considered.

## REFERENCES

1. SCHWARTZ, L.; PECK, S. M.; BOIVINICK, I.; LEIBOVITZ, A. L.; and FRASIER, E. S.; Control of ringworm of scalp among school children in Hagerstown, Md., 1944-1945. *J. A. M. A.* 132: 58-62, Sept. 14, 1946
2. MACKFEE, G. M.; HERMANN, F.; and KARP, F. L.: New treatment for anthropophilic tinea tonsurans (*Microsporon audouinii*); preliminary report. *J. Invest. Dermat.* 7: 43-52, Feb. 1946
3. SCULLY, J. P.; LIVINGOOD, C. S.; and PILLSBURY, D. M.: Local treatment of tinea capitis due to *M. audouinii*; importance of inflammatory reaction as index of curability. *J. Invest. Dermat.* 10: 111-118, March 1948.





# The Clinical Use of Antibiotics

## III. Treatment of Dental Infections<sup>1</sup>

PERRIN H. LONG, Colonel, MC, A. U. S.<sup>2</sup>

THE advent of the sulfonamides and of the antibiotics has placed powerful therapeutic tools in the hands of the dental officer and has revolutionized the treatment of dental infections. The dental officer should keep abreast of the latest advances in the field of the anti-infective agents, and especially in that of the antibiotics, because, at present, there are few indications for the primary use of the sulfonamides in dental infections. An understanding of proper dosage schedules and the clinical pharmacology and toxicology of the antibiotics is necessary if maximal benefits are to be reaped from the use of these agents in the prevention or treatment of dental infections.

### *Actinomycosis*

Because actinomycosis may arise in or about the structures of the jaw, the dental officer must always be on the lookout for it in patients in whom there is a delay in the resolution of, or a recurrence of, an inflammatory process, especially if the infection is accompanied by multiple draining sinuses. The treatment of actinomycosis of the jaw represents an instance which requires the cooperative efforts of the dental and medical officers. A combination of a preparation of penicillin G with sulfadiazine should be used in treating this disease.

### *Alveolar Postoperative Infection*

Alveolar postoperative infection in general is caused by a mixture of micro-organisms such as alpha hemolytic streptococci, staphylococci, *Borrelia vincentii*, and *Fusiformis dentium*. It occurs most frequently after extraction of third molars in the mandible. A preparation of penicillin G, especially an ointment of penicillin in an anhydrous, nonhydroscopic base, is recommended. Rarely more than two or three treatments at 24- or 48-hour intervals are needed to bring

<sup>1</sup>The third of four articles on this subject. Parts I and II appeared in the August and September issues of this JOURNAL.

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about the desired effect. If the indications are that an extraction will be difficult, it is a good plan to administer, as a prophylactic measure, 300,000 units of procaine penicillin G in oil with 2-percent aluminum monostearate added, about 4 to 6 hours before the operative procedure.

### *Cellulitis*

Dental infection is a common source for the development of extensive and rapid cellulitis of the floor of the mouth. Such a cellulitis represents a problem that frequently requires the combined attention of both the dental and medical officer. It requires prompt and intensive treatment if serious consequences are to be avoided. For instructions, see Streptococcal Infections.<sup>2</sup>

### *Cheilosis*

Angular cheilosis, especially if associated with lesions of the tongue, may be an early manifestation of riboflavin deficiency. The angular lesions may become secondarily infected with hemolytic streptococci or staphylococci. Give adequate doses of riboflavin provided in a good B-complex multivitamin preparation. If the infection is mild, nothing need be done except to observe the rules of cleanliness. If severe, the administration of two doses of 300,000 units of procaine penicillin G in oil with 2-percent aluminum monostearate added, at intervals of 72 hours, will, as a rule, control the infection.

### *Gangrenous Stomatitis*

This disease occurs in debilitated persons. Infection does not play a primary role but may be an important secondary factor. The bacteria involved are the normal inhabitants of the mouth. In treating patients with this disease use those measures that will normally control the cause of the debilitation. Initially, crystalline penicillin G is given intramuscularly in doses of 25,000 units every 3 hours. Aureomycin, given as recommended for moderately ill patients, may be used.

### *Herpetic Stomatitis*

Herpetic stomatitis is caused by the virus of herpes simplex and may occur as an isolated instance or may be epidemic. It is frequently misdiagnosed because the white, glistening vesicular caps are mistaken for flakes of exudate. Aureomycin should be tried as recommended for moderately ill patients. The auxiliary therapy is that of acute tonsillitis or pharyngitis. The soreness of the throat is generally out of proportion to the visible lesions.

<sup>2</sup> Part II of this series, p. 1001. U. S. Armed Forces Medical Journal, Sept. 1950, and Part IV (to be published next month).

### *Maxillary Sinus Infection*

If the dental officer has the misfortune to fracture the floor of the maxillary sinus during the extraction of an upper molar, he should promptly seek the advice of a competent otolaryngologist regarding specific treatment.

### *Oral Moniliasis*

This disease is not known to respond to sulfonamides or antibiotics.

### *Osteomyelitis*

Osteomyelitis of the mandible often follows a compound fracture of the jaw or the extraction of lower molar teeth when there has been much destruction of alveolar bone. When the infection is sharply localized, a typical "dry socket" is produced. If, however, the infection spreads to the inferior dental vessels, an extensive osteomyelitis may result. The bacterial flora in osteomyelitis of the mandible is generally mixed.

*Treatment.*—Either penicillin G or aureomycin may be used. If crystalline penicillin G is employed, the dose should be 25,000 units administered intramuscularly every 3 hours until the infection is controlled. The penicillin preparation of choice for most instances in which this drug is indicated is procaine penicillin G (300,000 units) with 100,000 units of crystalline penicillin G added. It should be given in watery suspension intramuscularly every 8 to 12 hours. As a third choice among the penicillins, 300,000 to 600,000 units of procaine penicillin G in vegetable oil with 2-percent aluminum monostearate added could be given intramuscularly at intervals of about 48 hours. When aureomycin is used it should be given in the doses recommended for moderately ill patients. As sequestra and necrotic material are almost invariably present in this condition, and because of the nature of the infection, there is little chance that sterilization of the lesion can be accomplished by the administration of antibiotics alone. *It is of the highest importance that proper surgical attention be given to the patient by a competent oral surgeon.* This is not an infection with which to experiment. The oral surgeon should be consulted at the beginning of the process. *If the extraction has been difficult and there is a possibility that a "dry socket" will result, a preparation of procaine penicillin G with crystalline penicillin G added, administered intramuscularly in aqueous suspension every 12 hours for at least 72 hours, should be used to combat the impending infection.*

### *Periapical Infection*

The treatment of periapical infection and the problems involved in it are those of the treatment of an abscess or an infected cyst. The

infection may be caused by any one of, or a mixture of, the micro-organisms which inhabit the mouth.

*Treatment.*—In the conservative treatment of periapical infection, a rapid- and slow-acting preparation of penicillin containing 100,000 units of crystalline penicillin G and 300,000 units of procaine penicillin G, administered intramuscularly in aqueous suspension at intervals of 8 to 12 hours, is of value in bringing the infection to the point at which surgical intervention is indicated. This treatment should be continued for at least 48 hours after incision and drainage have been accomplished. Other methods of antibiotic therapy have been tried. The area of the infection has been infiltrated with an aqueous solution of crystalline penicillin G containing 2,500 units per cc., together with the injection of small amount of the solution of penicillin directly into the pulp canal of the diseased tooth. The flooding of the diseased root canal with solutions containing 50,000 units of crystalline penicillin G has been advocated. Dental paper points containing 3,000 units of penicillin have been used for shortening the time supposedly needed for sterilizing the root canals in the treatment of periapical infection. In addition, incision and drainage help to eliminate or localize the infection. Cold applications to the face and hot irrigations intra-orally comfort the patient and assist in bringing about a resolution of the infectious process.

It is probable that aureomycin given orally will prove to be of value in the control of periapical infection.

### *Pericoronitis*

Acute pericoronitis is generally produced by one or a mixture of the normal bacterial inhabitants of the mouth. A penicillin ointment containing at least 1,000 units per cc. should be forced gently, through a blunted needle, between the erupting tooth and the soft tissue. This may be repeated as often as is considered necessary. Cold compresses applied to the face may reduce the pain incident to this infection.

### *Periodontitis (Pyorrhea)*

The cause of pyorrhea is not definitely known, but vitamin deficiencies are believed to be a contributing factor. The secondary infection is produced by a mixture of the micro-organisms which inhabit the mouth. There is no specific therapy. Improvement may be noted if the teeth are thoroughly scaled and then penicillin packs with dry tinfoil are applied. If a vitamin deficiency exists, therapeutic doses of vitamin C and of the B complex should be given. Antibiotics *do not* cure pyorrhea. They may help to decrease the severity of secondary infection.

### *Vincent's Infection*

While this disease may occur in endemic and epidemic forms, it is probable that it is not communicable in the ordinary sense of the word, and that, at least insofar as the endemic form of Vincent's infection is concerned, other basic causes are responsible. The exciting organisms are *Borrelia vincentii* and *Fusiformis dentium*. Other bacteria in the mouth may play some role in the production of the disease. The predisposing causes may be divided into those that are local and possibly those that are systemic in type. Among the supposed local causes are calculi, orthodontic appliances, metallic deposits, areas of occlusal overfunction, erupting of malposed teeth with gum flaps, overhanging gingival margins of fillings, ill fitting crowns, faulty restoration, and other results of poor dentistry. The systemic contributing causes include agranulocytosis, leukemia, aplastic anemia, certain vitamin deficiencies, and chronic malnutrition. Whenever possible, the local or systemic factors must be controlled if satisfactory results from antibiotic therapy are to be obtained and maintained. The local factors should always be corrected if possible by the dentist, and the dental officer in conjunction with the medical officer should attempt to correct adverse systemic factors which may play a role in producing this disease.

Penicillin is the drug of choice. Procaine penicillin G in doses of 300,000 units with 100,000 units of crystalline penicillin G added, in watery suspension, is given intramuscularly every 8 to 12 hours until the infection is controlled. Local factors which predispose the patient to this infection must be corrected.

### THE PROPHYLAXIS OF SYSTEMIC INFECTION IN DENTAL PRACTICE

The mouth is teeming with many different species of bacteria. Teeth that need to be extracted are generally infected with one or more varieties of the bacteria of the mouth. At extraction, host-parasite relations are disturbed and, in many instances, bacteria pour into the blood stream. As a rule, this bacteremia is transient and does no harm, but in patients who have rheumatic or other types of heart disease, these circulating bacteria may settle on the heart valve and produce subacute bacterial endocarditis. Patients who have acute, subacute, or chronic nephritis may have a flare-up of their disease following the extraction of teeth, and patients with diabetes often react poorly after the same procedure. *The dental officer should inquire of every patient for whom an extraction is advised as to whether that patient has had rheumatic fever or rheumatic heart disease, degenerative heart disease, nephritis, or diabetes.* If the inquiry elicits a positive reply, the patient should be treated prophylactically with penicillin or aureomycin before and after the tooth is extracted.



## SUMMARY

The treatment of dental infections has been revolutionized by the introduction of antibiotics. The dental officer should take full advantage of the benefits offered by these agents. In many instances, efficient treatment of infections of tooth and jaw structures is best achieved by a cooperative effort between the dental and medical officers



# The Care of Premature Infants

JOHN C. W. CAMPBELL, *Lieutenant, junior grade (MC) U. S. N.*

**I**N the period from 30 April 1947 to 1 May 1948 there were 828 live births recorded at the U. S. Naval Hospital, Philadelphia, Pa. Of these births, 56 or 6.75 percent were classified as premature—prematurity being determined according to the resolution adopted in 1935 by the American Academy of Pediatrics (1):

A premature infant is one who weighs 2,500 gm. (5.5 lb.) or less at birth (not on admission) regardless of the period of gestation. All liveborn premature infants should be included, evidence of life being heart beating or breathing

Fourteen premature infants did not survive beyond the tenth day: a mortality rate of 25 percent. The weight of these premature infants ranged from 364 gm. (13 oz.) to 2,380 gm. (5 lb., 5 oz.).

As shown in table 1, the greatest number of deaths were among those infants who weighed less than 1,500 gm. (3 lb., 5½ oz.). The lone survivor of this group weighed 952 gm. (2 lb., 2 oz.).

TABLE 1

Weight (grams)	Number of cases	Deaths	Mortality
			<i>Percent</i>
Under 999.....	8	7	87.5
1,000 to 1,499.....	2	2	100.0
1,500 to 1,999.....	8	2	25.0
2,000 to 2,399.....	33	3	9.1
2,400 to 2,500.....	5	0	0
Total.....	56	14	25.0

There were 14 deaths in this series (table 2). Autopsies were performed in all except one. Immaturity, the most frequent cause of death, accounted for 6 fatalities. Intracranial hemorrhage accounted for 3 deaths; erythroblastosis fetalis caused 1 death; congenital heart disease, 1 death; intra-abdominal hemorrhage, 1 death; and pneumonia caused 1 death.

## CARE OF THE PREMATURE INFANT

The care of the premature infant begins at the time of the delivery. We believe that with the close cooperation of the pediatrician and

TABLE 2

Case No.	Birth weight		Sex	Gestation age	Hours of life	Mother's Rh factor	Mother's blood Kahn test	Cause of death (autopsy)	Cause of immaturity	Findings
	Pounds	and ounces								
1	11 oz		F	24 wks	21"	Positive -	Negative	Primarily ..	Twin	None
2	15 oz		F	52 wks	10' 40"	(1)	do	do	Critical abortion	None
3	1 lb 4 oz		F	54 wks	20"	Positive	do	do	Levee's process	None
4	1 lb 5 oz		F	24 wks	12"	do	do	Critical hemorrhage	Twin	None
5	1 lb 8 1/2 oz		F	6 mo	11' 25"	do	do	Perforated intestines	Twin (unknown)	None
6	1 lb 12 oz		F	6 mo	11' 5"	do	do	Primarily	do	None
7	2 lb 3 oz		F	6 mo	11	Negative	do	do	Abortion	None
8	2 lb 5 1/2 oz		M	6 mo	128'	(1)	(1)	No autopsy, pulmonary embolism	Unknown	Formula
9	3 lb		M	6 1/2 mo	127'	(1)	Negative	Cerebral hemorrhage	do	Do
10	2 lb 10 1/2 oz		M	7 mo	10' 55"	Positive -	do	Primarily	Unknown	None
11	4 lb		M	9 mo	14' 55"	(1)	(1)	Cerebral hemorrhage	Twin	Formula
12	4 lb 10 oz		M	9 mo	17' 20"	Positive	Negative	Congestive heart failure	Prechlorella, chronic nephrosis	Evaporated milk
13	4 lb 12 oz		F	7 mo	209'	do	do	Primarily, two umbilical	Pre mature rupture of the umbilical	Formula
14	5 lb 5 oz		M	8 mo	62'	Negative	do	Frythroid atelectasis	Mother had 12 previous transfusions	Do

(1) Unknown  
 \* Mixture of skimmed milk solids, dextrin, maltose, corn oil, calcium caseinate, and lactified liver oil

obstetrician the number of neonatal premature deaths can be kept at a minimum. It is the practice of this service to have the pediatrician notified of any pending premature birth, in order that he might be present at the delivery.

In those cases in which there is great difficulty resuscitating the infant, especially with the smaller premature infants, the pediatrician takes over the task of resuscitation if so desired by the obstetrician. Any mucus, amniotic fluid, or meconium is removed from the air passages by aspiration to provide an unobstructed airway. Since inspiration frequently occurs as the head is delivered the obstetrician should aspirate as much mucus as possible at this stage.

Following delivery, the infant is placed in a warmed blanket and if the respirations of the child are normal, the child is moved to a heated crib in the nursery. If further resuscitation is necessary, and there is an adequate air passage, oxygen by face mask is given. In cases requiring prolonged resuscitating efforts, the infant is placed in a tub of warm water with temperature between 95° and 100° F. (2) to maintain body heat, and to provide a means of establishing a contrast in temperatures, which frequently acts as a respiratory stimulant. This is accomplished by removing the child from the warm water to the air at room temperature, not by plunging the infant in a tub of cold water. In this way the body temperature is not lowered appreciatively, but the purpose is accomplished.

Upon their arrival in the nursery, all premature infants weighing 5 pounds or less are placed in a previously heated incubator with an oxygen content between 45 and 50 percent and a relative humidity between 70 and 77 percent (3) (4). Menadoine, 2.0 mg., is given intramuscularly on admission to the nursery to elevate prothrombin levels and to prevent cerebral and umbilical hemorrhages (5) (6) (7). The air passages are cleared if necessary. The authors do not believe that any of the respiratory stimulants are of great value in resuscitation of the newborn.

The incubator is kept at a temperature sufficient for the premature child to maintain as near normal a body temperature as possible. Hot-water bottles are used in conjunction with the incubator heat, if necessary. It is desirable to maintain the percentage of oxygen between 45 and 50 percent and the relative humidity between 70 and 77 percent (4). The higher percentages are used with the smaller infants. As the child's weight increases, the concentrations of oxygen and percentages of humidity are dropped. High concentrations of oxygen are best with high percentages of humidity (3) (8).

As soon as respiration is established, the premature child is left alone for from 12 to 24 hours (depending on weight) with minimal

handling. No clothing is used except for a loosely pinned diaper: clothing means frequent handling. The larger infants are given 5 percent dextrose in distilled water by mouth at 12 hours (4); the smaller infants proportionally later. The method of feeding, again depending on weight, is by nipple or by gavage, using hypodermoclysis, as a means of maintaining body fluid levels. The larger and stronger premature infants are breast-fed, with supplementary feedings if necessary. The amount of formula by mouth varies from 4 cc. every 1 to 2 hours to 30 cc. every 3 hours. An artificial formula is given 6 to 12 hours after the initial feeding of dextrose solution. At this institution, we use a prepared mixture of skimmed-milk solids, dextrins, maltose, corn oil, calcium caseinate, and halibut liver oil for feeding the premature infant.

When administering fluids by hypodermoclysis, 20 cc. per kg. (3 dm. per lb.) is given, using the back as the site of injection (9). It is desirable to give 165 cc. to 200 cc. per kg. (2½ to 3 oz. per lb.) of body weight as the total amount of fluids for a 24-hour period.

As soon as the infant is taking the 5 percent dextrose solution without difficulty, we start a dilute formula, giving approximately 45 to 65 calories per kg. (20 to 30 per lb.) of body weight. When the infant is able to tolerate it, an increased and more concentrated formula is given. We believe that a high caloric intake is of importance for the rapid growth and development of the premature child. Therefore, we frequently give formulas which contain as many as 240 to 264 calories per kg. (105 to 120 calories per lb.). By the second day of life we supplement the diet with vitamins, especially vitamin C, giving 50 to 100 mg. daily (4) (10). As the premature infant grows older (age 21 days) we begin iron therapy in the form of elixir of ferrous sulfate (2).

A few days before discharge, the child is given an evaporated milk formula, using one part of evaporated milk to two parts of boiled water. The carbohydrates are supplemented by the addition of approximately 1 ounce of dextro-maltose. A water-soluble multivitamin preparation is added to one of the feedings. The child is fed every 3 to 4 hours as determined by weight and feeding demands. The discharge date depends on the progress of the infant and the home surroundings. The average premature infant is not discharged until it has reached a weight of 2,464 gm. (5 lb. 8 oz.). For those infants born of Rh negative mothers, a daily red blood cell count, hemoglobin, and a blood smear for immature red cells is done for the first 5 days of life, and then at weekly intervals until the child is 6 to 8 weeks old.

## COMMENT

Care of the premature infant demands special consideration and differs from the care required by full-term infants. Their environment and handling, as well as the special formulas necessitates close supervision and foresight on the part of the physician.

In a naval hospital, the rotation of nursery-room personnel requires that the handling of premature infants be standardized as closely as possible. With this in mind we have chosen a prepared mixture of skimmed-milk solids, dextrins, maltose, corn oil, calcium caseinate, and halibut liver oil as the simplest formula that possesses the nutritional value which the premature baby requires.

It has been shown in the studies of fat absorption by Tidwell et al. (11) (12) that olive oil and soy-bean oil are far more completely absorbed than butterfat. Further it has been observed that when these fats are substituted for butterfat, the weight gain is usually more rapid (11) (12).

In Adams' (13) series of 56 premature infants, who were given a simple evaporated milk formula, the average time required to regain birth weight was 12.5 days. In our series the average time required was 8½ days. This compares favorably with the grid as worked out by Dancis, O'Connell, and Holt (14) for recording weight of premature infants.

We believed that the ease in preparation of this type of formula is of advantage in that no great skill or complicated preparation is needed and yet standardized formulas are obtained.

The use of unmodified human milk for feeding, as shown by Gorden, Levine, and McNamara (4) does not give as rapid a weight increase as other types. Further, the necessity for collecting and pasteurizing human milk makes it less desirable than the use of readily available artificial formulas.

## CONCLUSIONS

1. The care of the premature infant begins at time of delivery.
2. Premature infants require an environment of high-oxygen content with suitable humidity and heat.
3. A high caloric intake is required for the growth and development of these infants.
4. Early addition of vitamins, especially vitamin C, to the diet of premature infants is of value.

## REFERENCES

- 1 DELEE, J. B., and GREENHILL, J. P. Principles and Practice of Obstetrics 9th edition W. B. Saunders Co., Philadelphia, Pa., 1947 p. 767.
- 2 NELSON, W. E. Mitchell Nelson Textbook of Pediatrics 4th edition, revised. W. B. Saunders Co., Philadelphia, Pa., 1945 p. 118.
- 3 CHAPPLE, C. C. Incubator for infants. *Am. J. Obst. & Gynec.* 35: 1062-1065, June 1978.
- 4 GORDON, H. H. (Denver), LEVINE, S. Z., and McNAMARA, H. Feeding of premature infants, comparison of human and cow's milk. *Am. J. Dis. Child.* 73: 442-452, Apr. 1947.
- 5 WILLY, H. Significance of disorders of blood coagulation; effects of vitamin K. *Monatsschr. f. Geburtsh. u. gynäk.* 115: 78-107, 1943.
- 6 HAUSSER, F. Prophylactic administration of vitamin K in 2,720 newborn. *Ann. paediat.* 159: 288-292, 1942.
- 7 REICH, C., MCCREADY, R. L., and CHAPLIN, H. Parenteral vitamin K therapy during antepartum period and its effects on infants prothrombin levels. *Am. J. Obst. & Gynec.* 53: 300-302, Feb. 1947.
- 8 CHAPPLE, C. C. The Controlled Physical Environment for the Premature and Older Infant. American Association for the Advancement of Science, Publication No. 17 pp. 251-253.
- 9 DAYSON, W. C. The Complete Pediatrician 5th edition Duke University Press Durham, N. C., 1946 p. 228.
- 10 SMITH, C. A. The Physiology of the Newborn Infant Charles C. Thomas, Springfield, Ill., 1945 p. 234.
- 11 TIDWELL, H. C., HOLT, L. E., JR., FARROW, H. L., and NEALE, S. Studies in fat embolism, fat absorption in premature infants and twins. *J. Pediat.* 6: 481-489, Apr. 1935.
- 12 HOLT, L. E., JR., TIDWELL, H. C., and SCOTT, T. F. M. Intravenous administration of fat, practical therapeutic procedure. *J. Pediat.* 6: 151-160, Feb. 1935.
- 13 ADAMS, F. H. Simple formula for premature and full-term infants. *J. Pediat.* 33: 23-28, July 1948.
- 14 DANCIS, J., O'CONNELL, J. R., and HOLT, L. E., JR. Grid for recording weight of premature infants. *J. Pediat.* 33: 570-572 Nov. 1948.



# Efficient Full Denture Service

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THE technique herein described should enable the operator to establish a more accurate functional bite registration in the construction of full dentures. Assuming that accurate impressions are obtained and correct vertical dimensions recorded, this technique will reduce occlusal adjustments to a minimum thus saving time and providing the patient with an accurate balanced occlusion free from lateral interference. Inasmuch as the Hanau articulator is now a standard item of supply, it is suggested that it be used whenever possible.

## THE GOTHIC ARCH TRACING AND ITS APPLICATION TO DENTURE CONSTRUCTION

The anterior segment of the mandible will scribe a gothic arch as the head of each condyle separately rotates in the glenoid fossa while the opposing condyle travels downward and forward if this movement is started from a true centric relation of the mandible to the maxilla at a given vertical opening. A gothic arch with straight lateral markings results if this movement is begun at a given vertical opening and the condyles are in the most comfortable retruded position in the glenoid fossa from which lateral movements can be made. When such a gothic arch tracing is produced it indicates that the mandible is in proper centric relation to the maxilla. Correct centric occlusion occurs when the patient closes the jaws during swallowing and at the end of each masticatory stroke. If accurate centric occlusion is not registered on the articulator the mandibular and maxillary teeth will not interdigitate in correct centric relation resulting in occlusal interference and trauma to the supporting tissues. If occlusal interference of the teeth is present a sequence of events will be established which will produce the following disturbing results: (a) Impact shock will produce trauma; (b) trauma will produce inflammation; (c) inflammation will produce ridge resorption; (d) ridge resorption will produce additional unbalanced occlusion; and (e) this additional unbalanced occlusion will lead to more trauma. This trauma may result in an inflammatory reaction in the soft tissue followed by osteoclastic resorption of the alveolar bone. Tenderness beneath the denture may occur, necessitating frequent adjustments and early and frequent re-basing, all contributing to the dissatisfaction of the patient.



Balanced occlusion may be established during the anteroposterior excursions of the mandible by use of a protrusive check bite record established on the gothic arch tracing. This record will measure the approximate distance the mandible drops, in the posterior region, when the patient protrudes the mandible from 4 to 6 mm. Such a range of movement exceeds the distance the mandible travels during the actual trituration of food but the relations obtained will establish occlusal balance during and at the end of each protrusive to centric masticatory stroke. Protrusive records, when transferred to a semi-adaptable articulator, permit setting the condylar elements of the articulator at an inclination which approximates the inclination of the eminentia articularis. Dentures constructed from an accurate centric record with teeth articulated in conformity with the anatomic condylar inclinations should be in balance when the mandible is in the incisive or centric position. Thus trauma is reduced, the patient's comfort enhanced, and masticating efficiency improved.

Additional data are obtainable from the gothic arch tracing if the maximum in balanced occlusion, during all the excursive movements of the mandible, is recorded. Right and left lateral plaster check bites will contribute to balanced occlusion during all of the eccentric to centric movements of the mandible. Records obtained by these lateral check bites may be transferred to the articulator and incorporated into the denture. Thus, it is possible to eliminate all cuspal interference during the excursive movements of the mandible. Failure to duplicate Bennett movement and centers of rotation results in cuspal interference during both eccentric to centric occlusion. This is expressed in a lateral force that is transmitted to the alveolar ridge.

If the triangle A B G (fig. 1) represents the mandible in centric position with G being the centric position of the tracing stylus, the following observations can be made. Consider D, B, and F as three separate centers of rotation, one of which will be correct for the patient. If the distance between the condylar elements of the articulator were the same as the distance between A and B, or the patient's intercondylar width, then the center of rotation of the patient's left condyle would be at B and the arc BB' would be scribed when the patient moved the mandible into right lateral positional relationship. This case could then be transferred to the articulator and the same arch produced. The patient's intercondylar width and the distance *between the condylar elements of the articulator are, however, rarely the same.* The anatomic rotation centers may be at D or F and consequently arches DD' or FF' would then be scribed. If the center of rotation of the articulator is at B and the patient's centers of rotation at D or F, the cuspal paths on the articulator would not travel in the same arc when placed in the patient's mouth. Thus cuspal interfer-

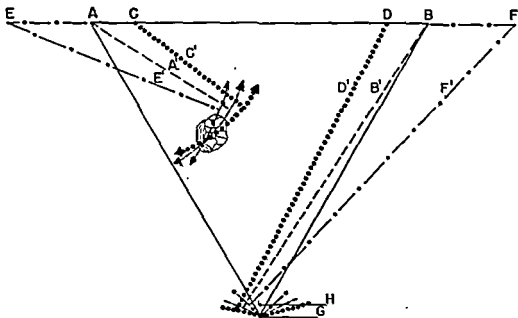


Figure 1.

ence would immediately occur when the mandible moved into lateral excursions. This is graphically represented by using E, A, and C as separate centers of rotation and EE', AA', and CC' as the paths produced by the mesiobuccal cusp of the lower right first molar. Note the different paths traveled by this cusp when E, A, and C, respectively, are used as centers of rotation. Certainly cuspal interference must occur when the center of rotation of the articulator and that of the patient do not coincide. There are additional factors such as Bennett movement that contribute to this error but they need not be considered here. The amount of cuspal interference that results when a case is constructed on a fixed articulator whose intercondylar width is different from that of the patient and with a centric relationship established at H instead of at G is obvious.

Lateral plaster check bites, when transferred to an adaptable articulator, will establish centers of rotation and Bennett movement on the instrument that are equivalent to those in the mouth. Dentures constructed on adaptable instruments from the check-bite records taken from gothic arch tracings will be more comfortable, more efficient, and less traumatizing than those constructed from haphazard mush bites and then made on a fixed articulator.

## TECHNIQUES FOR OBTAINING JAW RELATIONSHIP RECORDS

### 1. ARBITRARY WAX RIM TECHNIQUE

*Procedure.*—This technique entails the construction of an upper and lower wax bite rim. The occlusal plane is established on the upper wax rim and the vertical dimension record is determined by soft-

ing the lower wax rim and having the patient close into this softened wax until proper vertical opening is obtained. The wax rims are then chilled, the excess wax removed, replaced in the patient's mouth, and the patient closes in a relaxed position. Vertical marks are placed on the buccal and labial aspects of the wax rims and further checks made to determine whether the patient is in centric relation. With centric relation established as evidenced by the vertical lines on the wax rims, the wax rims are fastened in this position and carried to the articulator and mounted. The wax rims are then returned to the patient's mouth and a double thickness of softened wax placed on the lower rim and the patient instructed to protrude the mandible about one-fourth of an inch and close. The wax rims and wax protrusive bite records are returned to the articulator and the horizontal condylar elements set for steepness.

*Advantages.*—The advantages of this procedure are outweighed by the inaccuracies introduced at the time these records are taken, such as: (a) inaccurately fitting baseplates, (b) underextended baseplates, (c) overextended baseplates, and (d) insufficiently heated wax. Al-

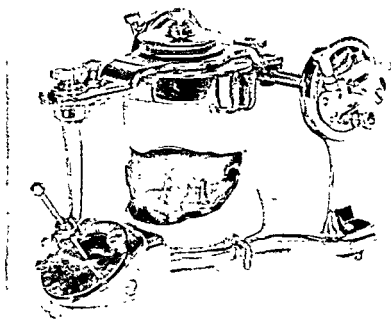
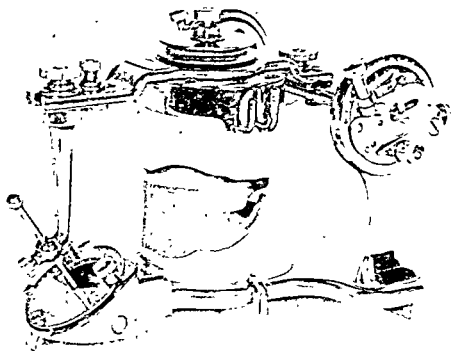


Figure 2.—Note defects in the baseplates and bite rims. The baseplates are not closely adapted to the casts. The posterior extremities of the baseplates are in contact. The lip contours were not established. The median line was not established. The centric lines in the posterior region are not well-defined.



*Figure 3.—These baseplates are accurately adapted to the ridges. The wax rims are neatly formed. The median line is established and lateral centric check lines are positive which facilitates their readability.*

though the procedure is not time consuming, accuracy instead of speed should be the goal at this stage.

**Disadvantages.**—The disadvantages of this method are (a) uneven pressure and displacement of ridge tissues and tissues in the condylar region caused by unevenly heated wax and subsequent pressure thereon, contributing to an overocclusion in the finished case; (b) difficulty in getting the patient to relax and assume a true unstrained centric relation; (c) shifting the bases caused by the bulk of wax, poorly adapted baseplates, and uneven heating resulting in cuspal interference in the finished case (fig. 2); and (d) warpage of baseplates and subsequent shifting.

**Precautions.**—To obtain accuracy by this procedure, closely adapted reinforced baseplates are essential (fig. 3). Acrylic bases are preferable. A layer of soft wax placed on the occlusal surface of the wax rim at the time of establishing vertical dimension is advantageous in minimizing uneven pressures and shifting of the bases. The technique itself is contributory to carelessness because of its apparent simplicity.

## 2. EXTRAORAL TRACING TECHNIQUE

*Procedure.*—Wax rims are constructed and vertical dimension records taken as previously described, then some form of extraoral tracing device is attached to the labial and buccal surfaces of the wax rims and a gothic arch tracing is scribed by the patient. The wax rims are fastened together when the stylus of the tracing device is located on the apex of the gothic arch tracing. A reasonably accurate centric relationship record is thus obtained.

*Advantages.*—The chief advantage of this procedure is that the tracing is in plain view to the operator.

*Disadvantages.*—Anteroposterior and lateral displacement forces are introduced while having the patient scribe the gothic arch tracing. This displacement force is caused by the stickiness of the occlusal wax surfaces that are in contact during the various movements of the mandible. Uneven and bilateral pressures on the wax rims, during the centric and protrusive positions of the mandible, would compress the underlying tissues resulting in incorrect positional mounting in the articulator.

*Precautions.*—Wax should be softened uniformly and to sufficient depth to insure equalized pressure during the closing procedure. This is a most difficult step and entails the use of accurately fitting bases.

## 3. INTRAORAL TRACING TECHNIQUE

*Procedure.*—Wax bite rims are constructed and the vertical dimension record established. A tentative centric relationship record is secured and the casts mounted on an articulator. A central bearing plate, with marking stylus, is attached to the upper occlusal wax rim. A central bearing plate, less stylus, is mounted on the lower wax rim after about 4 mm. of the lower wax rim has been removed. The stylus is then turned, in or out, until it contacts the lower tracing table in accordance with the vertical dimension maintained by the mesial guide pin of the articulator. The lower tracing table is coated with wax, carbon, or tracing ink. The wax rims, with intraoral tracing plates attached, are returned to the mouth and the patient instructed to generate a gothic arch tracing by moving the mandible anteroposteriorly and laterally. Light pressure should be maintained between the tracing plates during these movements. After an acceptable gothic arch tracing has been generated, the lower wax rim and tracing are removed from the mouth and a clear acrylic plate attached to the lower tracing table over the gothic arch tracing. The hole in the acrylic plate is placed directly over the apex of the gothic arch tracing. This will register the centric position of the mandible. The lower wax rim and tracing table are returned to the mouth and the patient instructed to close into the hole in the clear plastic disk.

Fast setting plaster is placed or injected between the base plates that record this centric record. The lower case is remounted with the aid of this plaster centric record. The lower wax rim and tracing table is returned to the mouth and the patient instructed to close into a second hole in the acrylic plate. This second hole is drilled  $\frac{1}{4}$  to 6 mm. directly posterior to the centric hole. Plaster is again injected between the bases. This record is used to set the condylar inclinations of the articulator (fig. 4).

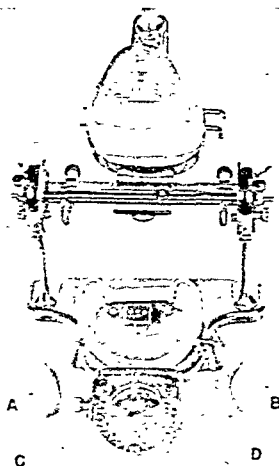


Figure 4.—Intraoral gothic arch tracing device. The four records obtainable are shown: (A) Right lateral record, (B) left lateral record, (C) centric record, and (D) protrusive record.

*Advantages.*—A gothic arch tracing is scried with a minimum of lateral thrust and consequently a minimum of displacement of the underlying ridge tissues. The record is taken under central bearing point pressure that distributes the stresses more uniformly over the denture-bearing area. This limits lateral stresses and consequent error caused by shifting of the bases.

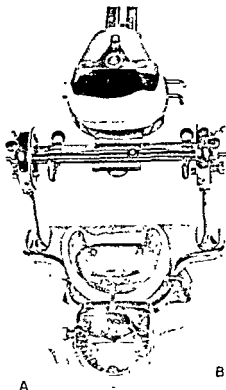


Figure 5—One type of intra- and extra-oral gothic arch tracing device. Note blunt intraoral tracing stylus. (A) Centric record, and (B) protrusive record.

*Disadvantages.*—There is danger of the bases skidding on the tissues because the patient is locked in centric position in the hole of the acrylic plate. Unless the tracing stylus is mounted in the center of the denture bearing area, there is danger of the closing pressure tipping the lower base.

*Precautions.*—Obtain a gothic arch tracing that has a definite apex and straight lateral sides. A gothic arch tracing with other than straight sides indicates that the heads of the condyles are not in their proper centric position. Have the hole in the clear plastic plate definitely located over the apex of the gothic arch tracing and securely attached to the lower tracing table. The coating on the lower tracing plate must be thin and evenly distributed so that a clear definite tracing will be produced and so that the clear plastic plate will seat without rocking. Steel marking ink is an adequate material for this purpose. Have the hole in the clear plastic plate accurately drilled and of the same size as the tracing stylus so that movement will not be possible.

Inspect for clearance between the bases in the heel sections. Have the tracing plates mounted so that they are parallel to avoid tipping when the patient closes the jaws. Grease the lower tracing plate to allow for easy movement of the tracing stylus.

#### 4. COMBINATION INTRA- AND EXTRA-ORAL TRACING TECHNIQUE

*Procedure.*—The technique is the same as that of the two preceding methods except that they are combined. The intraoral tracing stylus is rounded to reduce frictional contact with the lower tracing plate and consequently to reduce shifting of the bases during the excursive movements of the mandible (figs. 5 and 6).

*Advantages.*—A gothic arch tracing is secured with a minimum of lateral thrust and consequently a minimum of displacement of the

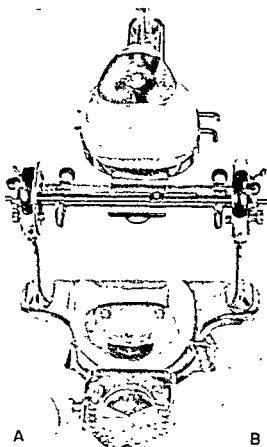


Figure 6.—A second type of intra- and extra-oral tracing device. The intraoral tracing stylus is blunt as shown in figure 5. The extraoral tracing device is a Gysi incisor path marker, with a fabricated metal tracing table. The three cone-shaped projections on the intraoral tracing device are used for re-seating the plaster check bite records after these records have been formed. (A) Centric record, and (B) protrusive record.



the operator to set the condylar guides of the articulator in an equivalent position.

*Disadvantages.*—The resistance to the three tracing studs offered by the lower compound rim may cause a lateral shifting of the bases and consequently contribute to an inaccurate record. The time element involved in chewing in the arrow-point tracings is lengthy. Patients with weak uncoordinated musculature may experience difficulty in cutting adequate arrow-point tracings. The procedure is quite messy from the standpoint of loose compound chips and debris that collect in the mouth during the operation.

*Precautions.*—Cutting studs must be sharp so they will cut the arrow-point tracings with a minimum of resistance. Accurate, well-adapted bases are essential. Arrow-point tracings must be well defined with sharp apices in order to contribute to an accurate centric relationship record. Patients must be instructed to chew rather than chop or holes will be made instead of arrow-point tracings.

#### TECHNIQUE ADVOCATED AND SERVICE RENDERED

To provide a technique for making more functionally accurate dentures, the following procedures were established, as an additional

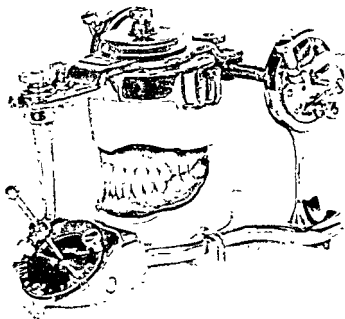


Figure 8—Tentative set-up of the 12 anterior teeth and bicuspid on the original bases.

service to stations in the Fifth Army Area, by the Central Dental Laboratory.

#### STAGE I

*Station procedure.*—Impressions are taken, bite rims are constructed and vertical dimension records established in accordance with modern accepted procedures. Proper mold and shade of teeth are selected and the case is mailed to the laboratory.

*Laboratory procedure.*—The cases are keyed and are then mounted on an articulator. The anterior 12 teeth and bicuspid are set in position in the original wax rims in conformity with existing ridge relation (fig. 8). A second set of acrylic base plates are made. Intraoral tracing plates are correctly located and attached to these acrylic bases. The tracing stylus is turned up or down so contact with the lower tracing plate is made at the same time that the incisal pin of the articulator contacts its guidance. The lower tracing plate is coated with steel marking ink. A small vial of marking ink and brush are sent to the station with the set-up so that in case of error the plate may be repainted. A clear acrylic plate, with one hole drilled, also accompanies the case. A suitable container accompanies the trial set-up in which the operator places the plaster cheek bites when returning the case to the laboratory.

#### STAGE II

*Station procedure.*—The trial set-up is tried and critically judged for accuracy as to appearance, vertical dimension, and horizontal and vertical overbite. Any changes necessary are made at this time. The bases with the tracing plates mounted thereon are placed in the patient's mouth and an arrow point tracing is generated. If the arrow point tracing is accurate as to a definite apex and straight lateral lines, the clear acrylic plate is luted to position over this tracing with the hole in the plate directly over the apex of the tracing. The bases are returned to the mouth and the patient is instructed to relax the mandible and close the jaws with the stylus seated in the hole in the acrylic plate. This gives the centric relationship record. A quick setting plaster is injected between the tracing plates or placed on the lower tracing plate prior to placing in position. This plaster cheek bite is marked "Centric relationship record." A second hole is drilled in the clear acrylic plate about 6 mm. distal to the first hole. This second hole, when recorded, gives the protrusive relationship record. The bases are again returned to the mouth and the patient instructed to protrude the mandible until the tracing stylus seats in the posterior hole in the clear acrylic plate. Fast setting plaster is again injected between the tracing plates or placed on the lower tracing plate prior to placing in position and this is recorded. This second

plaster check bite is marked "Protrusive relationship record." If the station desires to carry this procedure a step further and obtain the maximum in balanced occlusion two lateral plaster check bites are obtained. Two holes, one on either arch of the gothic arch tracing, about 6 mm. from the centric hole, are drilled in the plastic plate on the lateral lines of the tracing. Fast setting plaster is again injected as previously described. The trial set-up and plaster check bites are boxed and mailed to the laboratory.

*Laboratory procedures.*—The bases with the tracing plates are assembled with the centric plaster check bite and the lower case is remounted in the articulator (fig. 9). The protrusive and/or lateral plaster check bites are assembled between the bases and the condylar guidances of the articulator set to conform to these records. If lateral plaster check bites were taken, the case would be constructed on either a House or Stansbery articulator. The remaining teeth are set in position and articulated in accordance with lateral and protrusive movements generated by the articulator as set by the plaster check bites. The cases are waxed to anatomic requirements. The cases are split

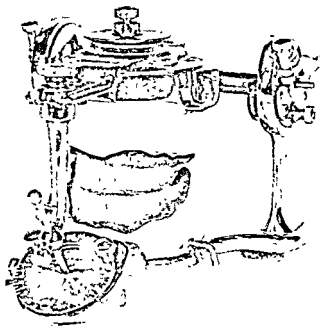


Figure 9—Original bite rims placed in position on the casts after the lower case was remounted from the plaster check bite centric record. Note anteroposterior and lateral positional relationship error and separation of rims on the left side of the arch. This case probably would have to be reconstructed.

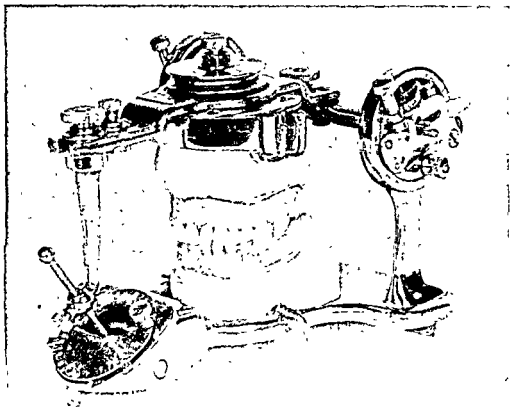


Figure 10.—Dentures fabricated on casts mounted in the articulator with the aid of an accurate plaster centric check bite record. These dentures have been worn for 8 months with only one post-insertion adjustment.

from the articulator, flaked, packed, and processed. Since the casts were keyed prior to mounting the case in the articulator, the casts are reclaimed from the flask and remounted in the articulator for discriminate and selective spot grinding and the occlusion further refined by judicious milling-in on the instrument. This milling-in should be considered a preliminary refinement of the occlusion in that the main object is to remove processing errors (fig. 10). A wax check bite, and remounting of the case for further milling should be accomplished after the dentures have been in service for several days.

Accurate centric relation and balanced functional occlusion are incorporated in full dentures constructed as here described. Such dentures will be free from all cuspal interference, and will eliminate many time-consuming post-insertion adjustments.

#### CONCLUSIONS

The principle of gothic arch tracings should be incorporated in the fabrication of more functionally accurate full dentures. The time saved on post-insertion adjustments together with the comfort and masticating efficiency the patient will enjoy, more than compensate

for the few additional minutes involved in obtaining centric and lateral check bite records. The bare minimum in technical procedure should include some form of the gothic arch principle if for nothing more than obtaining an accurate centric relationship record. This is essential since prosthodontists are charged with delivering to the patient the maximum in professional judgment and technical skill that modern dental science has to offer.



# Para-aminosalicylic Acid Resistant "Mycobacterium tuberculosis"

Incidence in Cases Treated at Fitzsimons Army Hospital

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ELEANOR H. GOOLEY<sup>1</sup>

THE increased in vitro resistance to para-aminosalicylic acid (PAS) of *Mycobacterium tuberculosis* isolated from patients receiving the drug has been reported by several investigators (1) (2) (3) (4). This increase in in vitro resistance has been associated with loss of therapeutic effect of the drug in animal experiments (5).

This article presents the incidence and degree of in vitro resistance to PAS observed in cultures of *Myco. tuberculosis* isolated from patients treated at Fitzsimons Army Hospital. No attempts will be made here to correlate clinical response, toxicity, or pathology with development of bacterial resistance.

## METHODS

Detailed procedures for performing PAS sensitivity studies on *Myco. tuberculosis* are presented elsewhere (6). Cultures of *Myco. tuberculosis* were isolated in the usual manner, subcultured in liquid media, and then on a modified Herrold's egg-yolk agar containing 0, 1, 10, and 100 micrograms per milliliter of para-aminosalicylic acid (as the sodium salt). The sensitivity studies were evaluated after a 10- to 14-day incubation. Growth on the control tube was arbitrarily considered as 4 plus and growth on the other tubes evaluated in terms of the control. One to twenty-five percent growth on the control tube was reported as 1 plus, 26 to 50 percent growth as 2 plus, 51 to 75 percent growth as 3 plus, and more than 75 percent growth as 4 plus.

## RESULTS

PAS sensitivity studies were performed on one or more cultures from 303 patients who had not received the drug. Minor variations in sensitivity were observed with different strains of *Myco. tubercu-*

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*lovis* and with different cultures from the same patient. The majority of the cultures produced from 0 to 3 plus growth on the 1-microgram per milliliter tube. A few produced as high as 4 plus growth on the 1-microgram per milliliter tube with a few colonies on media containing 10 micrograms of PAS per milliliter. In the absence of specific therapy, no increase in in vitro resistance was observed.

The results of the sensitivity studies of the first 37 patients to receive PAS therapy for 120 consecutive days at Fitzsimons Army Hospital are shown in table 1. Cultures from 6 of these patients were highly resistant to streptomycin. Because of the variation in growth on the 1-microgram per milliliter tube, only values on the control, 10- and 100-microgram per milliliter tubes were used to compile this table.

TABLE 1.—Analysis of in vitro resistance studies on *Mycobacterium tuberculosis* isolated from 37 patients receiving 120 consecutive days of PAS therapy

Patient	Total daily dosage (grams)	Number of days after beginning therapy						
		0-30	31-60	61-90	91-120	121-150	151-180	181-240
1	7.5	S	S	S	R(10)	R(10)	R(10)	S
2	7.5	S	S	S	S	S	S	S
3	7.5	S	P	S	S	S	S	S
4	7.5	S	S	S	R(100)	R(100)	P(100)	R(100)
5	8.4	S	S	S	P	S	P	S
6	9.6	S	S	S	S	S	P	ND
7	9.6	S	S	S	P	R(100)	R(10)	S
8	9.6	S	S	S	S	S	S	S
9	9.6	S	S	S	S	S	S	S
10	9.6	S	S	S	R(10)	R(10)	S	S
11	9.6	S	S	S	R(10)	R(100)	R(100)	P(100)
12	9.6	S	S	S	R(100)	R(100)	R(100)	R(100)
13	9.6	S	S	S	S	S	S	S
14	1.0	S	S	S	S	R(10)	R(100)	R(100)
15	1.0	P	S	S	S	R(10)	R(10)	R(100)
16	1.0	P	S	R(100)	P	R(100)	R(10)	P
17	1.0	P	S	S	P(10)	R(10)	P(100)	P
18	10.0	S	S	S	R(100)	R(10)	ND	ND
19	10.0	S	S	S	S	ND	ND	S
20	10.0	S	S	S	R(10)	R(100)	S	S
21	10.0	S	S	S	P	S	S	S
22	10.0	S	S	S	P(10)	R(10)	P	S
23	10.0	S	S	S	R(10)	P	R(10)	S
24	10.0	S	S	S	R(10)	P	S	S
25	10.0	S	S	S	R(10)	S	S	S
26	10.0	S	S	S	S	R(10)	R(10)	R(100)
27	10.0	S	S	S	S	S	S	S
28	10.0	S	S	S	S	S	S	S
29	10.0	S	S	S	S	S	S	S
30	10.0	S	S	S	S	S	S	S
31	10.0	S	S	S	S	S	S	S
32	10.0	S	S	S	S	S	S	S
33	10.0	S	S	S	S	S	S	S
34	10.0	S	S	S	S	S	S	S
35	10.0	S	S	S	S	S	S	S
36	10.0	S	S	S	S	S	S	S
37	10.0	S	S	S	S	S	S	S

Explanation of code letters:

— Cultures whose sensitivity studies showed no growth on the 10-microgram per milliliter tube

N—Negative cultures during period of evaluation

R—Cultures whose sensitivity studies showed growth comparable to the control tube on the tube shown in parentheses following the symbol

P—Positive cultures during period of evaluation, but no sensitivity study was performed because of contamination or insufficient material

ND—No specimen submitted for culture during period of evaluation

† Streptomycin-resistant

Analysis of table 1 reveals that 19 of the 37 patients yielded cultures resistant to 10 or more micrograms of PAS per milliliter during or after therapy. Seven of these patients now yield only cultures which are sensitive to PAS. In this series of patients there is no apparent correlation between total daily dosage or previous loss of streptomycin sensitivity and incidence of bacterial resistance to para-aminosalicylic acid.

### DISCUSSION

Additional PAS regimens are being investigated in the hope of delaying or preventing the emergence of bacterial resistance. Comparison with the data reported here will indicate the relative efficacy of these new regimens. At the present time the simultaneous use of PAS with streptomycin or other antituberculosis agents is receiving intensive investigation. Preliminary results (7) (8) show that the incidence of bacterial resistance to both drugs is greatly reduced by the practice of combined therapy. Intermittent administration of PAS alone, or preferably in combination with streptomycin, promises to delay the emergence of bacterial resistance compared to the rate with similar daily dosage regimens.

Bacterial resistance to PAS does not appear to be as permanent a phenomenon as loss of streptomycin sensitivity.

### SUMMARY

Cultures of *Myco. tuberculosis* from 303 patients who had not received para-aminosalicylic acid were uniformly sensitive to the drug. In vitro resistance to 10 or more micrograms of PAS per milliliter developed in cultures from 19 out of 37 tuberculous patients who received from 7.2 to 14.4 grams of the drug daily for 120 consecutive days.

### REFERENCES

1. KARLSON, A. G.; DALAUDE, A.; CARR, D. T.; PEUFTZ, K. H.; and FELDMAN, W. H.: Occurrence of tubercle bacilli resistant to P-aminosalicylic acid (PAS). *Dis. Chest* 16: 667-675, Dec. 1949.
2. EASTLAKE, C., JR., and BARACH, A. L.: Use of para-aminosalicylic acid in chronic pulmonary tuberculosis. *Dis. Chest* 16: 1-14, July 1949.
3. SWEAT, H. C.; TURNER, G. C.; LICHTENSTEIN, M.; and ANTON, S.: Preliminary report on use of para-aminosalicylic acid in treatment of pulmonary tuberculosis. *Dis. Chest* 16: 623-630, Dec. 1949.
4. DUNN, E.; BROWN, W. B.; and WALLACE, J.: Effect of streptomycin with para-aminosalicylic acid on the emergence of resistant strains of tubercle bacilli. *Dis. Chest* 16: 661-666, Dec. 1949.
5. KARLSON, A. G.; DALAUDE, A. M.; FELDMAN, W. H.; and CARR, D. T.: Effect of P-aminosalicylic acid (PAS) on tuberculosis in guinea pigs infected with tubercle bacilli resistant in vitro to PAS. *Proc. Staff Meet. Mayo Clin.* 25: 544, 1949.





*Figure 5—The line of incision for the columella flap is carried down to the columella cartilage. Intramarginal incisions are carried upward on each side of the columella in the mucosa.*



*Figure 6—Columella flap elevated. The leaves of the medial crura of the lower lateral cartilages are separated by blunt dissection down to the nasal septum. The dorsum of the nose is undermined and the periosteum over the dorsum nasal bones elevated to provide contact of the bone graft with bone.*

the columella cartilage. Intramarginal incisions are then carried upward on each side of the columella in the mucosa. The columella flap is then elevated and dissected free from the medial crura of the lower lateral cartilages (fig 6). This incision is practically invisible after healing because the shadow of the tip obscures the line.

With blunt scissors the soft tissue is freed over the nasal tip and lateral portions of the lower lateral cartilages. The soft tissue over the upper lateral cartilages is freed to release the depressed area and provide more room for the graft. The scissors are then carried over the nasal bones and straight to the root of the nose. A tunnel is formed. The periosteum is elevated over the dorsal ridge of the nasal bones and the radix nasi; this permits the bone graft to seat

directly in contact with the bone. The columella is then undermined to the anterior nasal spine; this permits seating of the columella strut directly on bone.

A trial of the graft is then made and further adjustments on the graft performed. When a satisfactory fit is determined the graft is inserted in the prepared pocket (fig. 7) and the columella flap brought down into position. The flap is sutured with No. 000000 in-



*Figure 7—Shaped bone graft ready for insertion into the dorsum of the nose.*

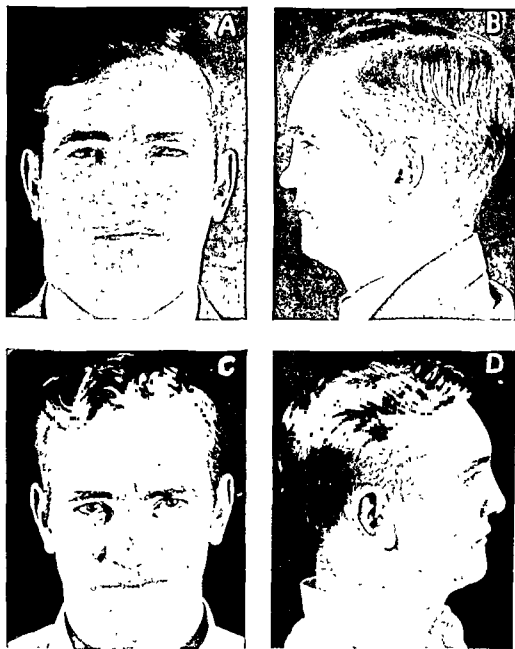


Figure 8.—Case 1. (A) and (B) Preoperative appearance, the result of nasal fracture. (C) and (D) Postoperative appearance. The nasal deformity has been corrected by an iliac crest cancellous bone graft in one continuous piece for the dorsum and columella. The contour is improved and the airways adequate.

interrupted nylon sutures. The marginal incisions are closed. Nasal packs are placed lightly in the nostrils. Compound tincture of benzoin is used to cover nose, upper lip, and cheeks. A piece of soft cloth is cut to fit the nose. Adhesive strips,  $\frac{3}{8}$  inch by 6 inches, are used to cover the dorsum of the nose and hold the graft in position. As the tapes go into position, blood and swelling is milked from the nasal

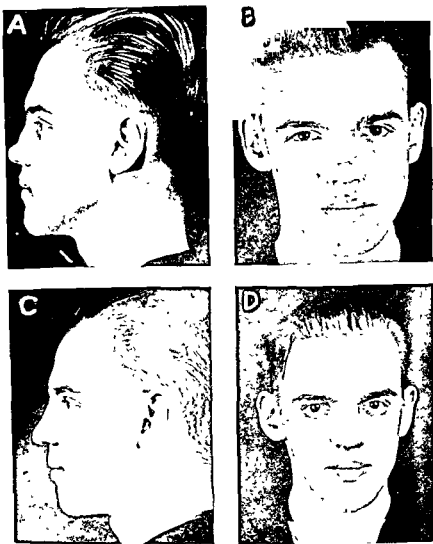


Figure 9—Case 2 (A) and (B) Preoperative appearance, congenital saddle nose (C) and (D) Appearance after deformity had been corrected with cancellous bone graft

dorsum and strips of tape are brought around the under surface of the nose to reduce the width of the ala and increase the height of the nose.

Modeling compound is fitted over the nose, using the adhesive tape as a base. The compound is similarly secured with narrow adhesive tape to the nose and face. Particular attention is paid to bringing in the sides of the splint with adhesive tape to reduce the width of the

alae. The patient is placed on penicillin therapy for 6 days. Packs are removed in 48 hours. The nasal splint is removed in 7 days.

Figures 8 and 9 show preoperative and postoperative appearance of two patients.

### CONCLUSION

Bone grafts to correct saddle-nose deformities can be secured in sufficient quantity from the iliac crest. These grafts are resistant to infection and provide a stable, easily worked material. Bone grafts hold the contour of the nasal dorsum more accurately than cartilaginous grafts. There is very little contracture and practically no loss of substance in the graft. The percentage of "takes" is uniformly good.

### REFERENCES

1. MAY, H.: *Reconstructive and Reparative Surgery* F A Davis & Co., Philadelphia, Pa. 1947. pp 277-278.
2. BRUNSON, M. I.: *Atlas of Plastic Surgery* Grune and Stratton, New York N. Y. 1948. p. 71.
3. SFELEY, R. C.: Composite bone graft in saddle nose *Plast. & Reconstruct Surg.* 4: 252-268, May 1949.
4. FOMON, S.; LUONGO, R. A.; SCHATTAER, A., and TURCHICK, F. Cancellous bone transplants for correction of saddle nose. *Ann. Otol. Rhin. & Laryng.* 54: 518-533, Sept. 1945.
5. PEMISTER, D. B.: Fate of transplanted bone and regenerative power of its various constituents. *Surg., Gynec. & Obst.* 19: 303, 1914.
6. PIERCE, G. W., and O'CONNOR, G. B.: Reconstruction surgery of nose *Ann. Otol. Rhin. & Laryng.* 47: 437-452, June 1938.





# Prosthodontia in Diastema

W. IRWIN GULLETT, *Lieutenant Commander (DC) U S N*<sup>1</sup>

**A**N EXAMPLE of using prosthetics to correct a fault that ordinarily would have to be corrected surgically or by orthodontics is presented.

## CASE REPORT

A routine dental check-up of a 33-year-old officer revealed a very wide diastema between the upper central incisors (fig. 1). He had discussed this anomaly with dentists from time to time but none had offered any hope of correcting the defect.

The space between the incisors (using a Boley gage) measured 5.4 mm, the width of the central incisors was 8.4 mm. This gave a combined space of 22.2 mm. To put three teeth in the space instead of the two that were there, each tooth would have to be 7.4 mm wide. This would be 0.6 mm narrower than the narrowest average central incisor.<sup>2</sup> It appeared possible to accomplish this and have an agreeable end result.

The first step was to take full-mouth impressions and run up some models in stone. The central incisors were then roughly prepared on the models as they would be if plastic jackets were going to be made. Blue casting wax was then applied to the pegs and a complete wax bridge was carved, filling the space across the anterior region. This step of constructing study models is very important before undertaking difficult and unusual cases because it indicates whether the end result will be satisfactory. From the model it was apparent that the space would take three teeth and give a good esthetic result.

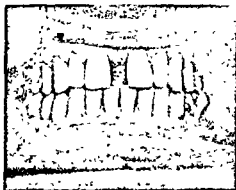


Figure 1.—Wide diastema between upper central incisors.

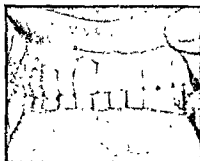
Full jacket preparations were cut on the two central incisors (fig. 2); copper band impressions taken of the two preparations, and a full upper impression in "hydrocolloid" was made. The copper band impressions were then poured up in amalgam; the resulting dies were inserted in the "hydrocolloid" impressions and the whole poured in stone. The shade, both incisal and gingival was carefully selected at this time.

<sup>1</sup> U S. Naval Air Station, Lakehurst, N. J.

<sup>2</sup> BLACK, G. V. . Descriptive Anatomy of the Human Teeth.



*Figure 2—Full jacket preparation of upper central incisors.*



*Figure 3—End result.*

The ridge between the incisor preparations was next relieved on the cast. Blue casting wax was then applied and the bridge, which consisted of two jackets and the middle dummy, carved. The usual procedures were followed in the curing and finishing of the all-acrylic bridge.

The end result (fig 3) was very gratifying to the operator and the patient thereby became psychologically better fitted to perform his duties.



# Exfoliative Cytology Service in an Army Hospital

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JANICE SUPFR, *B. A.*<sup>1</sup>

THE method of exfoliative cytology first introduced by Papanicolaou for the diagnosis of cancer has found wide application. Its main value lies in its potentialities of diagnosing cancer in parts of the body ordinarily inaccessible and also in the detection of cancer in the subclinical phase. Its value in the diagnosis of bronchogenic cancer by sputum and bronchial aspiration is now well-established. Although the recognition of cancer cells in pleural and abdominal fluids, gastric washings, urine, and prostatic secretions is more difficult, the number of cases detected justifies the use of this method. A recent modification of the procedure has increased the percent of cases diagnosed from examinations of gastric washings.

## ORGANIZATION

The fundamental factor for the detection and final diagnosis of cancer is the continued observation of the patient and close collaboration of the attending physician, pathologist, and cytologist. In an Army hospital, where both patients and staff are subject to transfers, certain measures are necessary to insure the follow-up of each patient. In each department concerned with the various phases of the detection and diagnosis of cancer, in addition to the patient's clinical record, a special index is maintained in which every transfer of the patient is registered. Notification for a follow-up examination is sent either to the patient or to both the patient and the attending physician at the Army hospital nearest the patient's new address. This is particularly important in cases in which there are cells in the smear of equivocal nature and also in patients who require periodic examinations extending over months or years. The same applies to patients in whom a positive smear was followed by a negative biopsy report and repeated smears and biopsy examinations were advisable. All doubtful cases are reviewed and discussed with a consulting cytologist.

<sup>1</sup> Oliver General Hospital, Augusta, Ga.



## PROCEDURE

Exfoliative cytology was used at this hospital for the past 2 years as a part of the routine physical examination of all patients; the patient not knowing for what purpose this examination was being made. At no time was it referred to as a "cancer test" in the presence of the patient. It was used as a screening test for the detection of early, clinically unrecognizable cancer in women without gynecologic symptoms, as well as in women who presented some specific complaint and in cases of suspected cancer in parts of the body other than the cervix uteri. For the detection of cervical cancer the equipment consists of swabs, numbered slides, and cards for adequate informative history on one side, the other side being used for the pathologist's report. The fixative consists of equal parts of 95 percent alcohol and ether in Coplon jars. These are placed in wire baskets throughout the hospital.

## METHOD

A swab is inserted about one-half inch into the cervical canal and the junction of the squamous and columnar epithelium is carefully swabbed. The applicator is then rolled onto a clean glass slide and immediately placed in the fixative before drying has occurred. The smears should be fixed for at least 10 minutes and may remain in this solution up to a week, after which they are stained by a modification of Papanicolaou's procedure and mounted with clarite. Douching or bathing, preliminary pelvic examination, or the drying of the smear before fixation are avoided. Performance of any one of these procedures may affect the characteristics of the secretions and may cause distortion of the cells. A screening technician systematically examines the entire slide of each vaginal and cervical smear, and marks the slides for further study by the pathologist. The interpretation of the slide requires extensive knowledge of exfoliative cytology. The appearance of the entire slide is important as the presence of erythrocytes or leukocytes, evidence of physiologic changes, pregnancy, radiation, and or the menopause, should all be considered.

Smears from other body fluids are made when the symptoms suggest the presence of cancer in a part of the body inaccessible to other diagnostic procedures, or in a patient in whom metastatic cancer requires a search for the primary lesion. The sputum is collected in a jar containing 70 percent alcohol and sent to the laboratory. Bronchial aspirations are placed in 95 percent alcohol and sent to the laboratory. The first specimen of gastric fluid should be the fasting gastric content aspirated through a size 14 Levin tube, after the patient has drunk water. When the stomach has been emptied, it is washed by forcibly injecting 100 cc. of saline solution, aspirating,

reinjecting and aspirating a few times. During this procedure the patient should change position several times and be allowed to get up and walk. The saline washings constitute the second specimen. The sediment from pleural and abdominal fluids is mixed with a double volume of 95 percent alcohol and sent to the laboratory. Prostatic secretion obtained by prostatic massage is collected in a container or on a clean slide which is fixed in ether-alcohol or 95 percent alcohol and sent to the laboratory. Catheterized urine is mixed with an equal volume of 95 percent alcohol and sent to the laboratory. All centrifuged sediments are placed on slides previously spread with Mayer's albumin glycerol. Smears of all body fluids are fixed for 1 hour in equal parts of 95 percent alcohol and ether and stained by the Papanicolaou method or with hematoxylin and eosin.

Since the adoption of this method, it was possible to detect cancer that would have otherwise remained unrecognized because other diagnostic procedures gave negative results. The final diagnosis of cervical cancer is never made from exfoliative cytology alone. When abnormal cells or cells with malignant characteristics are seen, another smear is usually obtained just prior to obtaining a specimen for biopsy, endocervical curettage, and endometrial scraping. Each positive smear must be confirmed by paraffin sections from cervical specimens for biopsy before a diagnosis of cancer is made. When the biopsy report is negative in the presence of a positive smear, the patient should be observed by repeated smears, preferably taken during the luteal phase. If subsequent smears are positive, additional specimens for biopsy are obtained. Following a tentative diagnosis by exfoliative cytology in the presence of a negative biopsy report, repeated smears are indicated, and, before clearance is given, at least three smears should be free of cancer cells.

### RESULTS

In the past 2 years about 6,000 patients were examined by this method and 35 cases of unsuspected cancers were detected. We believe that these results justify the use of this procedure as a part of the routine physical examination.

### DISCUSSION

Exfoliative cytology is of value in the detection of preinvasive cancer of the cervix and as an adjunct to the diagnosis of cancer in other parts of the body. To train technicians to read the slides requires a minimum of 6 months' instruction, preferably in a recognized cytologic center where a large volume of material is available for study. This should be followed by extensive practice. Any training period

In penicillin we do not have the sovereign remedy: all things will not yield to it; it has failed to become the substitute for the thought and drudgery necessary to evaluate the patient's complaints.



# Spontaneous Pneumothorax

## Observations on Twenty-six Cases

ROBERT K. MOXON, *Lieutenant (MC) U. S. N.*<sup>1</sup>

**S**PONTANEOUS pneumothorax is not a common condition, nor is it important statistically as a cause of morbidity or mortality. For example, in 1945 when the Navy and Marine Corps had a peak average strength of 3,673,855, the diagnosis of pneumothorax was made only 651 times (1). However, 65, or 10 percent, of these cases were readmissions; 83, over 12 percent, were invalided from the service; and 6 died.

As medical officers in the Armed Forces, we are in a position to observe far more than the usual number of patients presenting this syndrome since the age and sex incidence in this condition coincides precisely with that group of patients with whom we are most likely to come in contact, healthy young men.

There are two opinions concerning the pathogenesis of spontaneous pneumothorax. One is that of Macklin (2), who was able to demonstrate in animals that artificially induced elevation of intrabronchial pressure produced small but widespread rupture of the bases of the alveoli overlying the finer ramifications of the pulmonary vessels. This air gradually crowds into the sheaths of the larger blood vessels at the base of the lung and into the mediastinum, with the production of pneumomediastinum and, secondarily, through rupture of the visceral pleura, of pneumothorax.

The interrelationship of pneumomediastinum and pneumothorax has been demonstrated clinically, the most recent report being that of Dickie (3), who, in 20 university students, demonstrated pneumothorax alone in 6, pneumomediastinum alone in 7, and both conditions concurrently in the remaining 7.

The second view concerning pathogenesis is that of Ornstein and Lercher (4), who demonstrated fluoroscopically the sudden disproportionate overventilation of the lung apices when expiration was forced against the closed glottis (the Valsalva maneuver). They believe that apical overdistention, if repeated, could easily result in

<sup>1</sup>U. S. Naval Hospital, Philadelphia, Pa.



# Pediatric Excretory Pyelography

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CHARLES A. DEKOVESSEY, *Captain, MC, U. S. A.*<sup>2</sup>

**B**ECAUSE of the large amount of intestinal contents overlying the kidneys and ureters, adequate visualization of the renal collecting system by excretory pyelography in infants and small children is difficult. Matthei<sup>2</sup> has presented a method which re-



*Figure 1.—Pyelogram taken with conventional technique showing obscuring of dye by overlying intestines.*

<sup>1</sup> Brooke Army Hospital, Fort Sam Houston, Tex

<sup>2</sup> MATTHEI, L. P.: Improved pediatric excretory pyelography. *J. Urol* (In press)

moves much of the difficulty previously encountered. The simplicity of his procedure is striking, and is the result of the adaptation of the incidental finding of excellent roentgenograms taken when the child had been inadvertently fed immediately prior to radiographic study. His method is essentially as follows: (a) Withhold fluids for 12 hours prior to pyelography. (b) Inject 10 cc. of contrast agent intravenously, even in small infants; the dose may be adjusted for older children, and the intramuscular route, though less satisfactory, may be used. (c) At the time of injection of dye, give the infant a full 8-ounce feeding; older children may be given two glasses of chocolate milk. (d) Between pictures, keep the infants in a nursery cradle with the foot elevated, constituting a modified Trendelenburg position.

The rationale of this procedure is based on the transverse position of the stomach in the infant or small child. When filled with liquid, there is a homogeneous relatively radiolucent large oval area overlying the normal position of the contrast agent through displacement of the intestines. Figure 1 shows a roentgenogram taken 25 minutes



Figure 2.—Pyelogram taken 5 minutes after injection of dye in patient whose liquid-filled stomach has displaced the intestines.

after the injection of the dye in a 20-week-old infant without feeding at the time of dye injection. The inadequate visualization of the renal collecting system is noted. Figure 2 shows the easy visualization of the renal collecting system with a liquid-filled stomach. We have used this method 4 months and the increased diagnostic value of excretory pyelograms in infants and small children in this period has been gratifying. In some roentgenograms, when the concentration of the dye was slight and when the films were unsuitable for photographic reproduction, the contrast has been entirely adequate for diagnostic interpretation. This method is recommended for general use.







# Treatment of Intolerance to Quinacrine

JOSEPH E. SOKAL, *Lieutenant Colonel, MC, U. S. N. G.*<sup>1</sup>

QUINACRINE in doses of 0.1 gram daily was well tolerated by most troops in malarial areas. A small percent of the personnel reported unpleasant symptoms, usually gastrointestinal, when suppressive therapy was started. When quinacrine was given in spite of these usually mild symptoms, tolerance was quickly established and suppressive doses could be maintained indefinitely without further difficulty. A much smaller number of men, after ingestion of quinacrine, had severe symptoms that became intensified rather than diminished with further doses. Attempts to continue administration of the drug to such men produced severely ill soldiers who often refused further medication even when threatened with court martial. These men were considered permanently intolerant to the drug and the use of suppressive doses of quinine was authorized for such personnel.

The opportunity to observe the reactions of hardened troops to quinacrine occurred when an infantry battalion, after 2 years of duty in nonmalarial areas of the Central Pacific, was ordered to the South Pacific and antimalarial therapy was started. The troops were given 0.1 gram of quinacrine daily and were informed that a small percent might have gastrointestinal symptoms for the first few days but that these would disappear after several doses of the drug. The tablets were swallowed under the supervision of an officer and a company aid man. The aid men reported that a moderate number of men complained of symptoms referable to quinacrine ingestion in the first week. Only a few of these men were seen in the battalion aid station, all with one or more of the following symptoms: nausea, vomiting, abdominal cramps, or diarrhea. These men were reassured and instructed to continue taking the drug. A few were given 1 or 2 doses of tincture of belladonna or paregoric to control their symptoms. After the first week there were no complaints, with the exception of the cases herein discussed.

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Two men reacted to quinacrine in a manner quite different from those previously mentioned and were considered to belong to the group for which transfer to quinine suppressive therapy was authorized. The criteria used to place these men in a separate category were (a) a reaction to quinacrine severe enough to render them totally unfit for duty and to require medical attention, and (b) an increase in the intensity of symptoms with successive doses of the drug—in contrast to the usual course of events. Both men were in good health and were responsible and stable members of the organization, having served with distinction through two campaigns. Psychic factors were not believed to be responsible for their atypical reactions. Because of the anticipated difficulty of maintaining and supervising proper quinine dosage in future combat situations, it was decided to attempt to overcome the intolerance of these two men to quinacrine. It seemed possible that adaptation might take place in these men, as in others, if the drug could be administered and *retained* for a reasonably long period. In order to make this possible, prophylactic treatment against the expected signs of intolerance was begun before starting administration of the drug. The object was to paralyze the mechanisms whereby intolerance was manifested, then to administer quinacrine, and maintain the inhibition of anticipated symptoms until it could be assumed that adaptation had taken place. This was accomplished in both cases and the method was later successfully applied to a naval officer.

### CASE REPORTS

*Case 1*—A 29 year-old supply sergeant started quinacrine medication while at a beachhead supply dump. On the first day, he noted abdominal discomfort. Nausea and diarrhea appeared the second day and on the third day the diarrhea became severe and he vomited. He then reported to a medical officer at the beach, who discontinued the quinacrine, waited several days for symptoms to subside, and then attempted desensitization with fractional doses of the drug, starting with one-quarter of a tablet. Symptoms of intolerance immediately reappeared, in an even more severe form. The diarrhea was incapacitating by the second day and was associated with vomiting. The attempt was abandoned on the third day when repeated vomiting prevented retention of the administered dose. The soldier was then given a supply of quinine, which he took daily without any signs of intolerance.

On moving up to the battalion area, this soldier reported to the aid station for a resupply of quinine. He was persuaded to undergo a final attempt at overcoming his intolerance to quinacrine. Four cubic centimeters of paregoric and 15 drops of tincture of belladonna were given 4 times daily for 2 days. On the morning of the third day he complained of constipation and dryness of the mouth. He was then given one-quarter tablet of quinacrine and, because of obvious apprehension 0.1 gram of phenobarbital. He had one loose stool that morning and complained of some abdominal uneasiness. Belladonna and paregoric therapy were continued and two additional doses of 0.03 gram of phenobarbital were given that afternoon and evening. On the next day one-quarter

tablet of quinaerine was again given and the other medication was continued. He had no bowel movements or nausea that day and complained of drowsiness. On the fifth day, the dose of phenobarbital was reduced, only two doses of paregoric were given, and one-half tablet of quinaerine was administered. He had one soft stool. Sedation was discontinued on the sixth day but the other medication was maintained. On the sixth and seventh days, one-half tablet of quinaerine was given. On the eighth day, 5 days after starting the quinaerine, 1 tablet of quinaerine and 1 dose of belladonna and paregoric were given. Auxiliary medication was then discontinued and this soldier took 1 tablet of quinaerine daily without further evidence of intolerance.

*Case 2.*—A 38-year-old battalion commander started quinaerine medication when he returned to the organization after recovery from his combat wounds. Three to four hours after taking his first dose, he became nauseated, vomited several times, and complained of mild diarrhea and cramping abdominal pain. This reaction occurred at a regimental officers' party where he had consumed a large quantity of whisky, and the true cause of his symptoms was not realized. Two days later, he took another tablet of quinaerine and had a more severe attack of vomiting and diarrhea than on the first occasion. He then refused to take any more quinaerine.

Three weeks later he was persuaded to try to increase his tolerance to the drug. Four cubic centimeters of paregoric and 15 drops of tincture of belladonna were given every 4 hours, starting at noon. With the fourth dose at midnight, one-quarter tablet of quinaerine was given. At 0200 he had a watery stool and mild nausea. One-tenth gram of seconal was given at this time and the patient spent an uneventful night. On the second day, after similar preparation, he asked to be given one-half tablet of quinaerine at midnight, and took this larger dose with impunity. On the third day, his medication was changed to 1 motion sickness preventive (MSP) capsule every 4 hours because of favorable experience with this compound in treating nausea and vomiting unassociated with motion sickness. One-half tablet of quinaerine was again taken with impunity. On the fourth and fifth days, MSP capsules and 1 tablet of quinaerine were given. The patient's stools were normal and there were no untoward symptoms. On the sixth day, auxiliary medication was discontinued and daily doses of quinaerine were taken from then on without evidence of intolerance.

*Case 3.*—A naval medical officer on transport duty requested advice regarding one of the ship's officers who had severe nausea and moderate vomiting, without diarrhea, following the taking of quinaerine. Two attempts to administer the drug had been unsuccessful, in spite of the officer's wholehearted cooperation. The suggestion was made that MSP capsules be administered every 4 hours during the day and that quinaerine be given on the second day, with an initial dose of one-quarter tablet. This was done, and the dose of quinaerine was gradually increased on successive days. At the end of a week the officer was taking 0.1 gram of quinaerine daily without auxiliary medication and with no untoward symptoms.

## DISCUSSION

The cause of intolerance to quinaerine is unknown. It does not appear to be an allergic phenomenon. In many cases a distinct psychic influence has been implicated. It is generally agreed that, with few exceptions, if a man can be persuaded to take the drug regularly for a short time, symptoms of intolerance will disappear. The experience reported here suggests that tolerance can also be developed in many of

these exceptions. Whether it would be possible to overcome all intolerance to the drug cannot be stated on the basis of such a limited experience. Although this series is small, it includes all of the cases meeting the criteria for the discontinuance of quinacrine administration seen, and there were no failures. The successful results reported here were not considered to be the effect of psychotherapy. In the absence of any clear understanding of the mechanisms of intolerance to quinacrine, it is only possible to speculate as to why the treatment described gave such satisfactory results. Two factors are thought to be responsible. First, it may be assumed that a relatively stable, gradually increasing, tissue concentration of the drug was eventually attained in the treated cases. Such a state must be much more conducive to the normal process of adaptation to the drug, than the widely fluctuating concentration curve that is probably to be found in the person who has violent gastrointestinal reactions soon after ingestion of quinacrine. Second, by inhibiting the symptoms of intolerance, the establishment of an intense *conditioned response to the drug* is avoided. *The technique used in these cases should be generally applicable to similar problems with other therapeutic agents. Limited experience in a civilian general hospital suggests that this is the case.*



# The Early Diagnosis of Trachoma<sup>1</sup>

ADALBERT FUCHS, M.D.<sup>2</sup>

**A**LTHOUGH there are not many patients with trachoma in the United States, physicians in the Armed Forces may see such patients in the Pacific or in the Far East. Before World War I there were many patients with trachoma in Vienna, most of whom came from Hungary and Galicia. At one time there were so many patients with trachoma in the eye clinic, that my father, Ernst Fuchs, founded a special section consisting of an outpatient department and a 30-bed ward for them. In this section, special facilities for washing were provided to prevent the spread of infection by wash-basins and towels.

At that time much discussion about the diagnosis of trachoma resulted from the fact that many patients, especially school children, were seen with a slight conjunctivitis and a large number of follicles in the lower retrotarsal fold. These follicles resembled the nodules of trachoma. Schnabel maintained that those patients had trachoma, while my father and many others stated that these follicles were caused by follicular conjunctivitis and had nothing to do with trachoma, because with proper treatment these follicles promptly disappeared. The latter view came to be widely accepted.

Although persons with trachoma were not inducted into the Austrian Army before World War I, during the war they were accepted in special noncombatant trachoma battalions. After the war a part of Hungary with a German-speaking population was given as a Province to Austria. Thirty percent of the population in this territory were afflicted with trachoma. A campaign against trachoma was started and special care was given to school children. In 5 years trachoma was eliminated from this Province.

When I was in Peking in 1923, I saw a few patients with trachoma. The Chinese were using the same criteria in diagnosing trachoma that we had learned in Vienna. Very few of their cases were seen in the early stages, however. When I was again in China with the United

<sup>1</sup> Presented at Walter Reed Army Hospital, Washington, D. C., 20 March 1950.

<sup>2</sup> The New York Eye and Ear Infirmary.

Nations' Relief and Rehabilitation Administration and the World Health Organization in 1946 and 1947, I was surprised to find that great difficulty in diagnosis was being experienced. I was asked to examine the inmates of the Tsai Ho Ching Camp for destitute children. With 10 other trained ophthalmologists we examined more than 1,000 children, and found that many of the children between 6 and 14 years of age had a transparent conjunctiva and numerous yellow, steeply elevated nodules in the upper tarsus. The lower retro-tarsal fold showed little change and there was no hypertrophy of the conjunctiva. These were certainly not the typical findings seen in trachoma. Many of the Chinese oculists, however, diagnosed these cases as trachoma. The opinion and diagnosis of the Chinese physicians varied a great deal (table 1). It was surprising that the military survey shown in the table revealed more trachoma than the survey of refugees. In the Tsai Ho Ching Camp, I found trachoma in 65 percent while the 10 other observers found it in 92.5 to 100 percent. In patients with trachoma in the first stage the diagnosis was doubtful in 14 of my cases, so the true percent of trachoma was probably less than 65. It was also surprising that C. H. Chow found trachoma in only 33.5 percent of the patients in the outpatient department of the Peking University Medical College. The figures of E. Chang and H. H. Chi were likewise unusual since only patients with ocular disease were included in their study and a higher percent with trachoma would be expected. The Rotary Club in Lanchow, like several others in China, sponsors an outpatient department for patients with trachoma. For several weeks I examined all the patients in this department and found that only 52 percent actually had trachoma.

TABLE 1.—Percent of patients diagnosed trachoma in China

Observer	Source of patients	Number examined	Trachoma percent
C. H. Chow	Refugees	22**	41.4
C. H. Chow	Outpatient department Peking University Medical College	4150	33.5
Group of ophthalmologists	School children	231503	48.46
T. Y. Miao	Primary school children (Chengtu 1941-42)	4903	20
Chinese Army Medical Corps	Chinese Army guards of the I Corps	442	79.75
Group of 11 ophthalmologists	Refugee Camp Tsai Ho Ching	1617	65.13
Engene Chang	Inpatients West China University (1938-39)	1625	32.2
H. H. Chi	Inpatients West China University (1940-43)	2903	45
A. Fuchs	Trachoma section of outpatient department Lanchow	-	52

\* 20 percent considered doubtful not included in this figure

\*\* This is an average. The range was 42 to 62 percent

These discrepancies can only be explained on the basis of the diagnosis of common chronic conjunctivitis as trachoma. Furthermore,

two conditions are seen in China that are similar to trachoma: (a) yellow nodules in the transparent tarsal conjunctiva without special involvement of the upper and lower retrotarsal fold, and (b) severe chronic conjunctivitis caused by constant wind and dust leading to papillary hypertrophy of the conjunctiva. To diagnose these doubtful types of conjunctival change, smears of conjunctival epithelium were stained with Giemsa stain; if inclusion bodies were seen, trachoma was present. Another way to make a diagnosis was to give an adequate course of treatment in doubtful cases; if the conjunctival manifestations disappeared in from 4 to 6 weeks there was no trachoma. In former years, a treatment of at least 2 years was necessary to cure true trachoma. Today, 5 to 6 months usually suffices. At a meeting of the Bureau of Public Health in Nanking, 10 experienced Chinese ophthalmologists maintained that trachoma could usually be healed in 6 weeks. This statement only proves that most of the cases were not true trachoma. That true trachoma takes just as long a time for healing in China as elsewhere was shown by the fact that a Chinese ophthalmologist with trachoma still had active manifestations of the disease after 2 years of energetic treatment.

Although Duke-Elder<sup>3</sup> states that trachoma usually starts imperceptibly and subacutely, and this has been my experience, many ophthalmologists still believe that trachoma starts as a severe acute inflammation. It is true that in the beginning there is often a mixed infection. This is observed especially in Egypt where so many other types of severe infectious conjunctivitis are seen. In these cases, the virus of trachoma is transmitted with the conjunctival secretion. In Egypt the flies that often literally cover the eyes of children apparently transmit the disease.<sup>4</sup> In a country where there is much trachoma special attention must be paid to patients with severe conjunctivitis. Duke-Elder emphasizes the following characteristics of acute trachoma: (a) severe secretion and irritation; (b) a velvety papillary condition of the palpebral conjunctiva; (c) thin gray lines or points and sometimes larger foci in the superficial corneal layer; and (d) swelling and tenderness of the preauricular gland. The last finding is not present in chronic trachoma.

It is difficult to recognize trachoma in the early stage when there are no signs of irritation. I shall not discuss signs that can be seen only with the slit lamp. They are of scientific interest but for the examination\* of large numbers of patients we cannot rely on them.

<sup>3</sup> DUKE-ELDER, W. S.: Text book of Ophthalmology. Vol. II. C. V. Mosby Co. St. Louis, Mo., 1937 (reprinted 1946). p. 1611.

<sup>4</sup> FUCHS, A. Suggestions for prevention of blindness. Am. J. Ophth. 17: 232-237, Mar. 1974.



were reported. He had had repeated sore throat and enlarged tonsils for many years and had been advised to have a tonsillectomy.

On admission the temperature was 99° F., the pulse, 92, and the respirations were 20. The face and anterior portion of the neck were flushed. A discrete maculopapular rash was noted on the thorax and extremities; including the palmar and plantar surfaces with lesions measuring 0.5 to 1.5 cm. in diameter. There was conjunctival injection; no petechiae were seen; and the fundi were normal. The nasal passages were moderately congested and the tonsils were moderately hypertrophied and infected, but no membrane or exudate was seen. There was no cervical lymphadenopathy or rigidity. A soft, blowing, Grade I systolic murmur was heard just medial to the apex. The spleen was not palpable. The left hand, the right knee, and left ankle were diffusely swollen without evidence of effusion. The neurologic examination was normal. In the first week after admission the temperature varied between 99° and 102° F. There was a moderate tachycardia and the patient complained of malaise although he appeared to feel better than the objective findings warranted. A purpuric and petechial rash associated with an indurated macular area 3 cm. in diameter was noted about the ankles. Similar lesions were noted at the distal interphalangeal joint of the left third finger and at the base of the right thumb. These lesions were associated with swelling and moderate discomfort. No painful areas were ever found at the tips of the fingers or toes, nor were any typical petechiae seen on repeated examination of the conjunctivae, buccal mucosa, nail beds, or elsewhere.

The erythrocyte count on admission was 4.8 million with 14 gm. of hemoglobin. The leukocyte count was 14,000 with 87 percent neutrophils and 13 percent lymphocytes. Two days after admission the leukocyte count was 25,000; on the fifth day it was 29,000 with 73 percent neutrophils; and on the eighth day it was 25,000. The sedimentation rate was 40 (Wintrobe). Agglutinations for *Salmonella typhosa*, *Brucellae*, and heterophil antibodies were negative. The Weil-Felix reaction with ONK antigen was positive in a titer of 1:100. Repeated blood cultures were taken on thioglycollate media. Three were positive for *Neisseria intracellulorum*. Aspiration of the skin lesions failed to reveal any organisms. Cerebrospinal fluid studies revealed a normal pressure, clear fluid, and 3 leukocytes per cu. mm. An EKG revealed a sinus tachycardia, right axis deviation, and a PR interval of 0.16 sec.

Specific therapy and antibiotic drugs were withheld until a definite diagnosis could be established, then starting with an initial dose of 2 grams of sulfadiazine, the patient was given 1 gram of sulfadiazine every 4 hours and 50,000 units of penicillin every 3 hours. The temperature returned to normal by the following morning and remained so. No new skin lesions appeared. The rash slowly faded and disappeared. The leukocyte count and sedimentation rate returned to normal. Several blood cultures were negative and a second Weil-Felix reaction was negative. Penicillin and sulfadiazine were discontinued after 12 days of normal temperature, the patient having received 4,800,000 units of penicillin and 62 grams of sulfadiazine.

#### DISCUSSION

Herrick<sup>2,3,4</sup> believed that meningococcus infection occurred in three stages: (a) primary localization in the nasopharynx of patients, normal persons, and carriers; (b) invasion of the blood stream by the

more virulent organisms, sometimes lasting for weeks, months, or even years; and (c) involvement of the various systems. Hematogenous metastases to the meninges accounts for the more familiar meningococcic meningitis. Implantation may occur in the synovia causing arthralgia. Involvement of the capillaries and other skin structures produce various types of rash.<sup>12</sup> The concept of hematogenous spread as opposed to the alternative of direct extension along the nerve roots is now commonly accepted.<sup>13</sup> Hematogenous spread can be explained by a phagocytosis of the meningococci in the nasopharynx and then a breakdown of the phagocytes by the virulent meningococcic toxin liberating the organisms into the blood stream.<sup>14</sup>

In an epidemic outbreak 60 to 70 percent of the local population become carriers.<sup>9</sup> Although the proportion of carriers in a population, usually 2 to 10 percent between epidemics, may rise to 80 percent during an epidemic.<sup>10</sup> Bernhard and Jordan<sup>15</sup> reported that less than 25 percent of the cultures from the nasopharynges of 3,846 contacts were positive. Despite the fact that the disease, which is not highly contagious, occurs in epidemics, no remarkable incidence of cross infection has been demonstrated. Some as yet unknown factor probably causes the change from a carrier state to a diseased state. Broders and Snell<sup>16</sup> reported that as high as 35 percent of patients do not show meningeal involvement at the time of the initial diagnosis.

A typical patient with meningococcemia presents the findings of an acute febrile disease of abrupt onset associated with widespread skin lesions of various types with accompanying vague joint and muscle pains and often gives a history of antecedent upper respiratory infection. The fever is usually remittent, but not high. It may be quotidian, tertian, or even quartan and of short or long duration. The most significant clinical findings are the skin lesions that may be maculopapular, petechial, hemorrhagic, purpuric, or even necrotic in localized areas. They may resemble the lesions of erythema nodosum. The minimal petechial lesions centered in maculopapules have been likened to insect bites. A careful and repeated search should be made for the skin lesions as they may be few and evanescent. New

<sup>12</sup> HEINLE, R. W. Meningococcic septicemia: report of 5 new cases. *Arch. Int. Med.* 63: 575-583, Mar. 1929.

<sup>13</sup> STROVE, P. S. Recognition of meningococcic infections. *Am. J. M. Sc.* 206: 561-566, Nov. 1943.

<sup>14</sup> CAMPBELL, E. P. Meningococcemia. *Am. J. M. Sc.* 206: 566-576, Nov. 1943.

<sup>15</sup> BERNHARD, W. G., and JORDAN, A. C. Purpuric lesions in meningococcic infections: diagnosis from smears and cultures of purpuric lesions. *J. Lab. & Clin. Med.* 29: 277-281, Mar. 1944.

<sup>16</sup> BRODERS, A. C., JR., and SNELL, A. M. Fulminating meningococcemia with gangrene. *Am. J. Med.* 3: 657-660, Nov. 1947.



# Mesenteric Cyst

## Report of a Case

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**C**YST of the mesentery is a rare pathologic condition of surgical importance. It has a reported incidence of 1 per 100,000 hospital admissions (1). The great difficulty in making a preoperative diagnosis and the problems presented in the surgical treatment make it a subject of great interest.

There is a great difference of opinion in regard to the classification of mesenteric cysts, probably because their origin is obscure: many types have been described. According to Warfield (2) they originate from retroperitoneal organs, namely the germinal epithelium, ovary, wolffian or müllerian bodies. Remnants of these tissues are thought to be displaced between the leaves of the mesentery where they take up an independent and aberrant existence. A logical theory is that of displaced embryonal intestinal tissue. Other theories involve dermal inclusions, as suggested by Bartlett in 1923; angiomas; pseudocysts of bacterial, infectious, or of malignant sources; and lymphatic obstruction.

Many cysts remain so small as to be symptomless. However, symptoms may occur as the result of mass, traction, compression, or torsion with the resulting compromise of the intestinal lumen or of the blood supply. Chronic or acute intestinal obstruction was present in over 50 percent of the recorded cases (3).

Pathologically the two most commonly encountered mesenteric cysts are the enteric and those consisting of dilated lymphatic channels; the size varies greatly. Enteric cysts are usually unilocular and contain mucoid material. Histologically the wall of the cysts may duplicate that of the intestine. However, as the cyst becomes larger there may be a fibrous replacement of the mucosa and later of the muscle layer.

A correct preoperative diagnosis of the uncomplicated case is difficult and in the presence of the most common complication, intestinal obstruction, an accurate diagnosis is nearly impossible.

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the appendix found to be perforated just proximal to the tip. The bladder was edematous and pericystitis was present. The appendix was removed and 1 gram of streptomycin and 1,000,000 units of penicillin were placed in the peritoneal cavity. The incision was closed without drainage.

Postoperatively, intravenous fluids and Wangenstein suction were continued for 4 days. Convalescence was complete in 7 days and was uneventful except for the occurrence of a superficial wound infection. Streptomycin 0.25 gram every 6 hours for 5 days, was given intramuscularly. Penicillin, 100,000 units every 6 hours for 10 days, was also administered.

### DISCUSSION

The urologic manifestations of acute appendicitis include (a) disorders of micturition, (b) tenderness in the right costovertebral angle, (c) pain and retraction of the testes, and (d) abnormalities of the urine.

*Disorders of micturition.*—Urinary frequency and dysuria are the most frequent urinary complaints (1). These can be attributed to direct irritation of the renal pelvis, ureter, or bladder by the inflamed appendix. Because the appendix has at least six normal positions in the abdomen, namely, retrocolic, splenic, promontoric, pelvic, mid-inguinal, and paracolic reaching the right kidney, any portion of the genito-urinary tract can be affected (2). The most frequently involved site of irritation appears to be the right ureter at the brim of the bony pelvis. Urinary retention is caused by an irritation of the bladder sphincter, but this is an uncommon symptom (3).

*Tenderness in the costovertebral angle.*—Cope (4) found this to be a common symptom in appendicitis and maintained that it did not always signify a retrocecal appendix, since the pain could be elicited in patients in whom operation revealed the appendix not lying on the quadratus lumborum muscle. He believed such pain to be caused by hyperesthesia of the posterior area supplied by the tenth thoracic nerve, the segment that also supplies the appendix. When a perforated appendix lies on the quadratus lumborum muscle, this symptom is pronounced and simulates a perinephritic abscess.

*Pain and retraction of the testes.*—Testicular pain and discomfort occur in about 5 percent of male patients with appendicitis (4). The pain is usually not as severe as the abdominal pain, and is described as dull, aching, or sharp. This is probably a referred pain, since the appendix and testes are innervated by the same cord segment. The retraction of the right testis may be caused by direct irritation of the genitofemoral nerve producing a contraction of the cremaster muscle.

*Abnormalities of the urine.*—A few red blood cells are frequently seen in routine urine specimens of patients with appendicitis. In most cases this is caused by a true periureteritis (5) (6) (7). Frank hematuria that disappears after appendectomy in otherwise typical

cases of appendicitis has also been described. Ehlert (1) explained the pyuria similarly. The inflamed appendix in contact with the right ureteral wall produces a periureteritis and ureteritis that results in pus cells being cast into the ureteral lumen, eventually appearing in the urine. Harbin (6) believed the pyuria to be caused by a concomitant pyelitis. The appendicitis and pyelitis are thought to be metastatic infections arising from some common focus. Another factor, especially in chronic pyelitis caused by chronic appendicitis, may be a lymphogenous ascent of colon bacilli up the periureteral lymphatic vessels to the kidney. Van Duzen (7) listed appendicitis as the probable cause in 7.6 percent of 300 cases of pyelitis. Massive pyuria can occur when an appendiceal abscess ruptures into the bladder. Albuminuria is usually attributed to the pus and red blood cells in the urine.

The patient described in the case report presented an array of urinary symptoms and signs suggestive of a genito-urinary disorder. Although cystoscopy and pyelograms frequently aid in making the correct diagnosis, visual signs of cystitis, ureteritis, or pyelitis would not account for the presence of peritonitis. The wisdom of early laparotomy in this type of case is well substantiated by the unfortunate result in the case reported by Ehlert (1). Acute appendicitis which can usually be easily recognized and diagnosed in its typical textbook form may also present a problem calling for the greatest diagnostic acumen.

#### REFERENCES

1. EHLERT, C. D.: Urologic manifestations of appendicitis. *J. Urol.* 43: 468-475, Mar. 1940.
2. TREVELS, F.: *Surgical Applied Anatomy*. 9th edition, revised by C. C. Choyce. Lea & Febiger, Philadelphia, Pa., 1934.
3. DEWEE, J. B.: *Treatise on Appendicitis*. P. Blakiston's Son & Co., Philadelphia, Pa., 1896.
4. COPE, Z.: Genito-urinary symptoms in acute appendicitis. *Proc. Roy. Soc. Med. (Sect. 1 vol.)* 15: 1, Nov. 1921.
5. STEED, K.: Hematuria in appendicitis. *Surg. Clinics, Chicago* 1: 1097, Oct. 1917.
6. HARBIN, R. M.: Incidence of kidney infections in acute appendicitis. *Southern M. J.* 14: 139, Feb. 1921.
7. VAN DUZEN, R. E.: Report of 300 cases of pyelitis. *Texas State J. Med.* 22: 670-651, Feb. 1927.



special emphasis on basic research. During periods of armed conflict, the exigencies of war require immediate application of new methods, weapons, and practical means of defense against them. Advances in military medicine must then be confined to applied research and development. But as time marches on, our stockpile of science and of scientific talent must be increased between wars by basic research, which can be pursued to best advantage during periods of peace when graduate students can be thoroughly trained at universities, teaching hospitals, and at naval research facilities as capable scientific investigators.

Research as such may be defined as critical investigation or experimentation to establish or discover new facts. Without research, modern medicine never would have become "modern." If medical research, both basic and applied, were prohibited by lack of funds, facilities, personnel, or vision (or all four), military medicine would promptly wither away.

The importance of basic research to the military surgeon must be apparent when we consider the "who, what, when, where, why" of atomic energy. Knowledge of nuclear fission grew to its present formidable estate by virtue of two factors; basic science and teamwork between basic scientists and administrators in devising methods for practical application of fundamental knowledge. The sum total of science is derived from the contributions of many minds, research laboratories, and countries where freedom of thought, freedom in scientific research, and freedom of expression are (or were) considered sacrosanct. This outstanding example of the dependence and interdependence of practical or applied science upon fundamental research and basic investigation in pure science is familiar to all of us. Surely, the Manhattan Project needs no scientific justification.

In the fields of medicine, both military and civilian, the discovery and development of penicillin demonstrate the correlation between basic and applied research and emphasize once again the crucial importance of fundamental investigations in the basic sciences as applied to the healing art. Penicillin was discovered by Sir Alexander Fleming in 1928, but its lifesaving potentialities were not recognized until 1939, when it was determined by other medical scientists that this new drug possessed antibiotic activity. Military necessity then demanded the rapid development of this "product" of basic research in microbiology, so that the manufacture and distribution of a complex chemical compound, considered a mere laboratory curiosity until the Battle of Britain began, had grown to a gigantic industrial endeavor by 1945, when the Rising Sun of Japan foundered beneath the western horizon.

## PHILOSOPHY

Fundamental principles derived from laboratory research in the basic medical sciences must be applied in the clinical treatment of the ill or injured patient. Technical data from numerous and diversified engineering laboratories implement procedures in preventive medicine for the control and eradication of tropical and infectious diseases. Hence, the modern military surgeon can fulfill his mission because today's research in medicine and the sister sciences becomes tomorrow's practice, both in peace and in war.

Of arms and the man, man is indispensable. No industrial machine or engine of war has yet been devised better than the personnel who operate it. Thus, man-power is and will continue to be our greatest and our most precious asset. The preservation of man's health, efficiency, and morale has been and will continue to be proportional to the advances in scientific medical research available to the military surgeon in his unceasing effort "to bring light to them that walk in darkness and in the shadow of death, and to guide our feet in the paths of Peace."





umpire coverage of the Army medical units participating. Each battalion aid station (figs. 1 and 2) and regimental collecting station was assigned a separate medical umpire, as was each separate medical unit and each company within the divisional medical battalion. In addition, one Navy medical officer was assigned as Navy medical liaison officer with the Army Umpire Group.

### UMPIRE TRAINING

An umpire school was conducted for all ground umpires at Headquarters, Army Umpire Group, Camp Lee, Va., to prepare the umpires to carry out their assignments with optimal proficiency. The initial phases of the instruction covered basic orientation concerning organization and employment of the arms and services organic to an infantry division, indoctrination concerning the Aggressor concept, and a re-



Figure 2.—Interior of aggressor aid station established in Operation Portrex

view of the umpire manual and general umpiring principles. A great deal of instruction was given in signal communications and familiarization with the signal equipment to be used by umpires in the proposed operation. Later, the umpires were given ship-to-shore amphibious training at Little Creek, Va., followed by a trip to Langley Field, Va., where various aircraft and their capabilities were demonstrated. The terminal portion of the umpire training was devoted to a command post exercise, and separate conferences on specific medical check lists to be used in the actual operation. All umpires were then transported

to Vieques Island where a base camp for the Army Umpire Group had been established. While there, an on-the-ground terrain study was made of the maneuver ground, including a detailed study of possible landing beaches. A series of field problems were conducted on the actual maneuver terrain, initially, without troops and later with participating troops of the Aggressor Force, prior to the actual maneuver.

The umpires designated to umpire units of the Joint Task Force were then transported by air back to Norfolk where they joined their respective units. This arrangement allowed for on-the-ground reconnaissance of the maneuver area prior to the operation, better familiarization with the personnel, equipment, and plans of the Aggressor Force, and yet enabled the umpires to observe the actions of the Joint Task Force troops from embarkation to actual beach landings and the maneuver proper.

#### UMPIRE OPERATIONAL PLANS

The general maneuver plan was based on the following assumption: The United States and an enemy nation known as Aggressor were at war. The island of Vieques represented an area of a large theoretical continent and was held by Aggressor troops in garrison after being heavily fortified with well-prepared defensive positions. The Aggressor Forces were in possession of short-range tactical aircraft and submarine forces. The Vieques area was designated by the United States for seizure through amphibious and airborne means, in order to develop a base for a future strategic air operation. It was further indicated that the amphibious operation would be launched from the continental United States and the airborne operation from friendly territory in the Vieques area. The entire operation was to include major land, sea, and air operations.

In the operation, assessment of casualties was carried out by the unit umpires. Medical umpires only assessed casualties occurring in personnel within the specific medical unit being umpired. Casualties were assessed appropriate to the action, with every effort made to promote and further realism. Casualties so assessed were tagged with one of three types of tags: (a) a red tag for seriously wounded casualties, (b) a green tag for slightly wounded walking casualties, and (c) a white tag for those dead as a result of the specific action. A definite appropriate diagnosis appeared on the tag, calculated to necessitate certain specific first-aid and medical treatment procedures on the part of those medical personnel manning the various medical installations. Also, specific instructions to the assumed casualty were on the tag, governing what physical actions, if any, he might take

certain organizations; and (c) the number of board-certified and board-qualified officers that would be available to each using command in the succeeding fiscal year. It was believed that by carefully evaluating each of these elements, the requirement of and the authorization to each command would be equitably resolved.

This action has been completed and each using command has been advised of its authorization. In general, the civilian consultant program for the fiscal year 1951 has been designed to effect a reduction of about \$250,000 below the amount expended in the fiscal year 1950. Concurrent with the aforementioned study, efforts were made to determine a method by which all using commands could be made responsible for the appointment and reimbursement of their respective consultants. These efforts are in keeping with the decentralization directive of the Chief of Staff. It has been determined that such a decentralization will be effected on or about 1 January 1951 so as to give this authority to continental Army commanders, the Commandant, United States Military Academy, and the commanders of Tripler and Rodriguez Army Hospitals. At present such authority is exercised only by the commanding officers of the named Army hospitals in the continental United States. Specific instructions will be issued when appropriate.

As a result of this evaluation it may be concluded that the Medical Service will continue to implement its civilian professional consultant program in the most economical manner that will assure the desired results.



## BOOKS RECEIVED

- SIMPLIFIED CHEMISTRY EXPERIMENTS**, by Armand Joseph Courbaine, *Instructor in Biological Chemistry, Hahnemann Medical College, Philadelphia, Pa.; Science Instructor, Hahnemann Hospital School of Nursing, Philadelphia, Pa.; formerly Laboratory Supervisor, Human Serum Albumin Department, Sharp & Dohme, Incorporated, Glenside, Pa.; formerly Analytical Chemist, The Barrett Division, Allied Chemical & Dye Corporation, Philadelphia, Pa.* Edited by M. Cordelia Cowan, Illustrated by Richard Albany. 234 pages. Illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1950. Price \$2.80.
- A TEXTBOOK OF ORTHODONTIA**, by Robert H. W. Strang, M. D., D. D. S., *Director of courses in orthodontia in the extension teaching departments of Columbia University and the University of Toronto; Director of the Fones School of Dental Hygiene, University of Bridgeport, Co-editor of "The Angle Orthodontist", Consulting Oral Surgeon to the Bridgeport Hospital, Bridgeport, Conn.* 3d edition. 825 pages. Illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$15.
- A TEXTBOOK OF PSYCHIATRY** for Students and Practitioners, by Sir David Henderson, M. D. (Edin.), F. R. F. P. S. (Glas.), F. R. C. P. (Ed. and Lon.), *Physician Superintendent of the Royal Edinburgh Hospital for Mental Disorders, and Professor of Psychiatry, University of Edinburgh, and the late R. D. Gillespie*. 7th edition. 740 pages. Oxford University Press, New York, N. Y., publishers, 1950. Price \$7.75.
- ANNUAL REPRINT OF THE REPORTS OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION**, with the comments that have appeared in the Journal of the American Medical Association, 1949. 231 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$2.
- TYPES OF DIABETES MELLITIS AND THEIR TREATMENT**, by Arthur R. Colwell, M. D., *Associate Professor of Medicine and Director of Medical Specialty Training, Northwestern University Medical School, Attending Physician, Evanston Hospital, Consulting Physician, Wesley Memorial Hospital, Municipal Tuberculosis Sanitarium, Chicago, Ill.* Publication Number 67, American Lecture Series. 97 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.
- THE PHYSIOLOGICAL BASIS FOR OXYGEN THERAPY**, by Julius H. Comroe, Jr., *Professor of Physiology and Pharmacology, Graduate School of Medicine, University of Pennsylvania; Clinical Physiologist, Hospital of the University of Pennsylvania; and Robert D. Dripps, Professor of Anesthesiology, University of Pennsylvania School of Medicine. Director of Anesthesiology, Hospital of the University of Pennsylvania.* Publication Number 42, American Lecture Series. 85 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.
- MALIGNANT DISEASE AND ITS TREATMENT BY RADIUM**, by Sir Stanford Cade, K. B. E., F. R. C. S., M. R. C. P., *Surgeon, Westminster Hospital; Consulting Surgeon, Mount Vernon Hospital and Radium Institute; Lecturer in Surgery, Westminster Medical School and formerly Examiner in Surgery, University of London; Member of the Council and of the Court of Examiners, late Hunterian Professor and Arris and Gale Lecturer, Royal College of Surgeons of England; Hon. Member American Radium Society; Consultant in surgery to the Royal Air Force, with a foreword by Sir Ernest Rook, Carling, F. R. C. P., F. R. C. S., F. F. R., Consulting Surgeon and Vice-President, Westminster Hospital.* Volume III. 2d edition. 446 pages. Illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$12.50.
- PYR'S SURGICAL HANDBOOK**, A Manual of Surgical Manipulations, Minor Surgery, and Other Matters Connected With the Work of Surgical Dressers, House Surgeons and Practitioners, edited by Hamilton Bailey, F. R. C. S. Eng., *Surgeon, and Surgeon-in-charge of the Genito-urinary Department, Royal Northern Hospital, London;*

is most welcome. The authoritative role given the therapist throughout the part of the book dealing with treatment of specific reaction patterns although useful in some situations, may in itself place undesirable limits on therapy with many patients. This is especially true with children. It was disappointing to find the primary therapeutic recommendation in emotionally disturbed children was "placement in a foster family or boarding school."—*Commander M. E. Roundbush (MC) U. S. N.*

**PENICILLIN AND STREPTOMYCIN IN THE TREATMENT OF INFECTIONS** by Chester S. Keefer, M. S., M. D., Sc. D. (Hon.), *Wade Professor of Medicine, Boston University School of Medicine; Director of Evans Memorial and Physician-in-Chief, Massachusetts Memorial Hospital, Boston. Chairman, Committee on Chemotherapeutic and Other Agents, National Research Council, Consultant to the Committee on Medical Research, Office of Scientific Research and Development, Washington, D. C., and Donald G. Anderson, M. D., Instructor in Medicine, Boston University School of Medicine. Research Fellow in Medicine at Evans Memorial; Assistant Visiting Physician, Massachusetts Memorial Hospital, Boston, Mass., edited by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), M. A., C. P., Hon. F. R. C. P. (Can.), D. S. M. (A. M. A.) *Hessey Professor of the Theory and Practice of Physics Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts Medical School; Sometime Physician-in-Chief, Carney Hospital, Sometime Visiting Physician, Beth Israel Hospital, Physician-in-Chief Emeritus, Peter Bent Brigham Hospital, Boston, Mass.* (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work.) III pages. Oxford University Press, New York, N. Y., publishers, 1950. Price \$2.50.*

Here, two sections from the Oxford Loose-leaf Medicine are separately bound and offered as a book. The same plates were used so the pages bear their original numbers from the larger work. The section on penicillin consists of 47 pages of text and 18 pages of bibliography which is classified under various subtitles. The section on streptomycin contains 30 pages of text and 12 pages of bibliography similarly classified. The emphasis is on treatment. The text has been condensed until there seems to be hardly a single superfluous word. For the busy general practitioner who desires the latest authoritative word on these drugs, this is the book. It has an index.—*Commander H. J. Altis (MC) U. S. N.*

**A PRIMER OF VENOUS PRESSURE**, by George E. Butch, M. D., *Henderson Professor of Medicine, Tulane University School of Medicine, Senior Visiting Physician, Charity Hospital, Consultant in Cardiovascular Diseases, Ochsner Clinic; Visiting Physician, Touro Infirmary, New Orleans.* 174 pages illustrated. Lea & Febiger, Philadelphia, Pa., publisher, 1950. Price \$4.

Few subjects in medicine have received more attention in recent years than the cardiovascular system. Early in this study particular interest was directed toward the heart, and recently the peripheral circulation has been the source of much investigation. The venous system has lagged behind and this book calls attention to the importance of experimental and clinical investigation in this area. The book is primarily concerned with fundamentals but includes a practical discussion of bedside techniques of venous pressure measurement. The author makes no claim to an exhaustive treatise on the subject of venous pressure but has brought a neglected subject to the attention of medical students and clinicians. Officers in the field will find the discussion of arteriovenous aneurysm of

interest. There is no bibliography. The illustrations, binding, and index are excellent.—*Lt. (jg) D. B. Carmichael, Jr. (MC) U. S. N.*

**A SHORT HISTORY OF PHYSIOLOGY**, by Kenneth J. Franklin, D. M., F. R. C. P., *Professor of Physiology at the Medical College of St. Bartholomew's Hospital*. 2d edition. 147 pages; illustrated. Staples Press, New York, N. Y., publishers, 1950. Price \$2.

This concise volume condenses the history of physiologic endeavor up to the beginning of the twentieth century. Covering such a wide period, it hardly does more than catalogue names and events. This is done by centuries and by organ systems, however, and with the coherence and readability that characterize so many British authors. Da Vinci, Fernel, and Vesalius are treated, deservedly, in separate chapters, and Harvey is dealt with in great detail. Professor Franklin believes: " \* \* \* it would be invidious for me, as a practicing physiologist, publicly to assess the work of others still alive." Still, it is unfortunate that the events of this century are omitted entirely. For the serious student this book would make an excellent reference text leading to further detailed reading, and at the same time would serve as a valuable orientative work for the more casual historian of physiology and medicine.—*Lt. R. K. Moron (MC) U. S. N.*

**THE PRACTICE OF MEDICINE**, by Jonathan Campbell Meakins, C. B. E., M. D., LL. D., D. Sc., *formerly Professor of Medicine and Director of the Department of Medicine, McGill University; formerly Physician-in-Chief, Royal Victoria Hospital, Montreal; formerly Professor of Therapeutics and Clinical Medicine, University of Edinburgh; Fellow of the Royal Society of Edinburgh; Fellow of the Royal Society of Canada; Fellow of the Royal College of Physicians, London; Fellow of the Royal College of Physicians, Edinburgh; Honorary Fellow of the Royal College of Surgeons, Edinburgh; Fellow of the Royal College of Physicians, Canada; Fellow of the American College of Physicians; Honorary Fellow of the Royal Society of Medicine*. 5th edition. 1,558 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$13.50.

This attractive fundamental textbook of medicine has undergone four revisions since 1936. It begins with an introductory chapter to the practice of medicine, usually missing or meager in similar modern texts, and then successively considers each system, except the skin and organs of special sense. All of the subjects are presented by Dr. Meakins except for the sections concerned with diseases of metabolism, the endocrine, urinary, and nervous systems, and the chapter on psychosomatic medicine. Few internists today would undertake such an enormous task of single authorship and the success of this volume is a tribute to the wealth of experience, breadth of vision, and proficiency of literary expression of the author. The 518 photographs and diagrams, of which 50 are in color, are an outstanding feature. Since the fourth edition, published in 1941, about 100 pages and 2 color plates have been added. Two new and excellent chapters, one on psychosomatic medicine by Dr. Hanson and the other on chemotherapy and antibiotics, are the major additions. The former constitutes a distinct advance as there is nothing to compare with it in any other current general book on medicine. Dr. Mason has revised the excellent chapter on diseases of metabolism and has collaborated with Dr. Hoffman in rewriting the section on diseases of the ductless glands. Dr. Schriver's division on diseases of the urinary system has also been brought up to date and includes a discussion of lower nephron nephrosis. The large section on neurology by Dr. Petersen

at hand, and yet the possibility of brucellosis must constantly be in the minds of those who practice in remote areas. The symptoms are treated both in general and by regions. This latter approach makes it clear why this book is important to many specialists. The problems of diagnosis are described individually and then considered in their interrelationship. Laboratory methods are described sufficiently to make them understandable and references are available for the technical details. There is an excellent condensed section on differential diagnosis. The chapter on treatment takes up one by one the various proposals that have been made in recent years and points out their successes and shortcomings. This section is up to the minute in that recent additions to the antibiotics are considered. The various biologic preparations are given appropriate recognition. Unique and particularly interesting is the chapter on psychologic studies appearing first in this edition. Here the psychosomatic aspect of the disease is presented in a way that holds one's attention. Thoroughly adequate chapters on the epidemiology and prophylaxis of brucellosis are included.

One often reads of this or that book as being indispensable in the physician's library. If such a collection exists this book will surely find its place there. Specialists or general practitioners, in urban or rural areas, will profit by reading this book. It may well become one of the American medical classics.—*Commander H. J. Airts (MC) U. S. N.*

**AMPUTATION PROSTHETIC SERVICE**, by Earle H. Daniel, *Director of Prosthetic Service, Institute of Physical Medicine and Rehabilitation, New York University, Bellevue Medical Center. Prosthetic Consultant to Bellevue, City, Goldwater Memorial, Metropolitan, and University Hospitals, New York, N. Y.*, with foreword by Howard A. Rusk, M. D., *Professor and Chairman of the Department of Physical Medicine and Rehabilitation, New York University College of Medicine, Director, Institute of Physical Medicine and Rehabilitation, New York University, Bellevue Medical Center.* 327 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$7.

This text should be of great value and interest to anyone associated with amputees, as it presents much valuable information as to types and construction of prostheses. It is written from the prosthetic maker's point of view, yet by one who is well versed in the necessity of coordinating the efforts of the many skilled and professional persons who work with the amputee. The author presents answers to many problems that confront the surgeon in prescribing the proper prosthesis for his amputee patient and in training him in its use. He also presents in detail the many factors in proper fitting and construction of artificial limbs and includes a valuable Buyer's Guide for purchase of materials, a List of Certified Limb and Brace Makers, a Selected List of Motion Pictures on Rehabilitation and Physical Medicine, and a Glossary of Prosthetic Terms. The numerous illustrations aid greatly in the presentation of the subject which often is primarily technical in relation to the construction of prostheses. A wealth of practical information as to the proper fitting of artificial limbs, the correct type of limb, preparation of the stump, and training use of the limb is included. I believe that every surgeon who performs amputations as well as those who take part in the rehabilitation of amputees, such as the specialist in physical medicine and rehabilitation, the physical therapist, and the prosthetic makers should be acquainted with this book.—*Commander J. S. Thieme, Jr (MC) U. S. N.*

**NEW DISCOVERIES IN MEDICINE, Their Effect on the Public Health**, by Paul K. Hawley. 134 pages; illustrated. Columbia University Press, New York N Y publishers, 1950. Price \$2.50.

The material presented in this volume is a compilation of a series of Bauppton lectures delivered by the author. They were designed for presentation to a lay audience and much of the content is not challenging to the physician. Four topics were considered: blood, operations on the heart and lungs, prevention and treatment of mental disease, and the socioeconomic aspects of medical care.

Except for minor considerations the picture presented to the nonprofessional person is clear and valid. The discussion of the relationship of the Rh factor to pregnancy seems unnecessarily threatening, and the complexities of cardiac operations force the author into extremely superficial treatment of this subject. In the area of medical economics, however, both the layman and the physician will find a stimulating discussion. It is in this field that Dr. Hawley has spent many years and here he has made an outstanding contribution. Although many will find his viewpoint unilateral, few will find a better statement of the problems which confront those who would alter the present free-enterprise system. As the pros and cons of "socialized medicine" continue to be weighed, it seems mandatory that physicians, as protagonists in the controversy, should be fortified with all possible facts and mature opinions. The author of this book has contributed both, and his conclusions merit attention.—*Lt. (jg) D. B. Carmichael, Jr. (MC) U. S. N.*

**A TEXTBOOK OF ORAL HYGIENE AND PREVENTIVE DENTISTRY**, by Russell W. Bunting, D.D. Sc., *Professor of Dentistry and Dean of the School of Dentistry, University of Michigan*, and collaborators. 240 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$5.

Professor Bunting opens the text with a definition of oral hygiene and closes it with a discussion of the present status of the modern dental hygienist. In the chapters between, he and a group of well-known collaborators have concisely presented the subject of preventive dentistry, including descriptions of the more commonly seen pathologic disturbances, their cause, and methods for their control. The 240 black-and-white illustrations and a color plate add to the value of this book which should fulfill the need for a one-text reference on basic science principles for the dental hygienist.

Kerr provides a chapter on the histology of oral structures which includes a chronology of human dentition.

In another chapter he discusses the role of traumatic occlusion in oral disease and describes a technique for the equilibration of occlusion. Bunting discusses the physiologic function of the mouth and its part in the human economy. He also devotes a chapter to accretions on teeth, including extrinsic and intrinsic stains. Jay offers a chapter on the history of caries research. Robinson discusses periodontal disease and includes an admirable one-page classification of cause, pathologic changes, and symptoms. Burket provides a chapter on stomatitis. Harli's chapter on oral prophylaxis includes a description of a technique for the operator, a patient's toothbrushing technique, and a discussion of dentifrices. Kahn discusses the modern concept of the role of dental foci in systemic disease, and Wisan reviews the status of dentistry in public health.

The format, binding, and paper are excellent and the illustrations are well reproduced.—*Maj. J. E. Chippa, DC, U. S. A.*



the problem is both basic and clinical, dealing in the first three chapters with every aspect of the nature and function of the clotting process and the relationship of clotting to hemostasis, the latter seven chapters are concerned with the clinical aspect of thrombo-embolic diseases and their therapy, with special emphasis on dicumarol. This book has been written for the clinicians and pathologists who are faced with the problems of anticoagulant therapy daily, and who do not have the time to cope with the voluminous and often contradictory literature on the subject. An appendix consisting of the most accurate and practical laboratory methods in the study of hemorrhagic diseases and anticoagulant therapy is presented. One of these is the photo-colorimetric determination of dicumarol plasma concentration which may in the future obviate the necessity of daily prothrombin times in the use of dicumarol. Every clinician and clinical pathologist concerned with anticoagulant therapy should be familiar with this book.—*Lt (jg) P. K. Hamilton (MC) U. S. N.*





COVER PHOTOGRAPH

*With United Nations Forces in Korea.—A South Korean nurse dresses the arm of an American soldier.*

# UNITED STATES ARMED FORCES MEDICAL JOURNAL

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## Foreword

THE UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes, descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services, and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers, officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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The summary should be a factual and brief recapitulation of the observations or statements contained in the article. The conclusions drawn from the case experiment, or facts set forth should be clearly stated and should appear at the close.

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Address: U. S. Armed Forces Medical Journal, Bureau of Medicine and Surgery, Department of the Navy, Washington 25, D. C.

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*The opinions expressed in this publication are not necessarily those of the Department of the Army, Department of the Navy, Department of the Air Force, or Department of Defense. References to regulations, orders, circular letters, or directives are for information only and do not, by publication herein, constitute authority for action.*

*Any reference in an article of this publication to a proprietary drug or its chemical formula shall not constitute an endorsement of its efficacy or use in the treatment of any disease.*

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Exchange of publications will be extended to medical and scientific organizations, societies and journals. Communications on this subject should be addressed to the Editor, UNITED STATES ARMED FORCES MEDICAL JOURNAL, Potomac Annex, Department of the Navy, Washington 25, D. C.

#### REPRINTS

The Superintendent of Documents will furnish on request prices for reprints of 100 or more copies of articles contained in the UNITED STATES ARMED FORCES MEDICAL JOURNAL. Orders for reprints must be placed within 2 months after date of publication.

For prompt attention requests must be addressed as follows: Superintendent of Documents, Attention: Procurement Section, Government Printing Office, Washington 25, D. C.

#### THE JOURNAL IS INDEXED IN THE FOLLOWING PUBLICATIONS

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warning or foreplanning, a small segment of the United States Air Force (USAF) transported almost 2 million tons of material into Berlin. This article covers only the Airlift as conducted by the USAFE\* (4 Air Force Wings, 2 Naval Transport Squadrons, and USAFE supporting troops). The contribution of the U. S. Army in Europe, the Third U. S. Air Division in England, of the Air Matériel Command in the Zone of the Interior, and of the British and French Forces are beyond the scope of this study.

### ORIGINAL SITUATION

A review of the situation when the Airlift began is essential for full understanding of the difficulties encountered. The following factors were severe handicaps in the engagement and performance of this mission.

*Indefiniteness.*—The mission of flying over 5,000 tons of material daily to a given destination could probably be accomplished with no extraordinary difficulty if there was a clear delineation of the beginning and ending of such a project and if there could be prior planning. The Berlin Airlift began with scant warning and there was no possible way to estimate the length of the mission.

*Personnel available.*—In June 1948, there were about 15,000 USAF personnel assigned to USAFE. Of these, less than 2,000 were aircrew members. The majority, if not all, of such aircrew members were, at the beginning of the mission, engaged in other duties essential to the mission of USAFE, and as such, could not be spared en masse to take over the Airlift.

*Available airfields.*—In June 1948, USAFE had only two operational air fields within reasonable flying distance of Berlin. These two air bases, Wiesbaden and Rhein/Main (fig. 1), had shortages of storage space, maintenance space, and above all, troop housing, that did not allow the performance of the minimal demands of the mission.

*Housing facilities.*—In June 1948, Wiesbaden and Rhein/Main housed about 1,000 and 3,000 military personnel, respectively. Full use of these air bases demanded doubling of the population of both but even this could not meet the minimal needs of the Airlift.

*Number of available aircraft.*—In June 1948, the only transport type aircraft available to USAFE were 107 C-47's, all of which were worn war products and presented serious maintenance difficulties. The number of operational C-47 aircraft could not have carried the minimal tonnage to Berlin, although they had been operated constantly.

\* United States Air Force in Europe

*Extent of aircraft maintenance facilities.*—In June 1948, USAFE maintenance facilities consisted of the number of personnel necessary to meet the maintenance needs of the assigned C-47's. Intensification of use of C-47's would severely tax the available facilities. Using them 24 hours a day was beyond the maintenance capabilities.

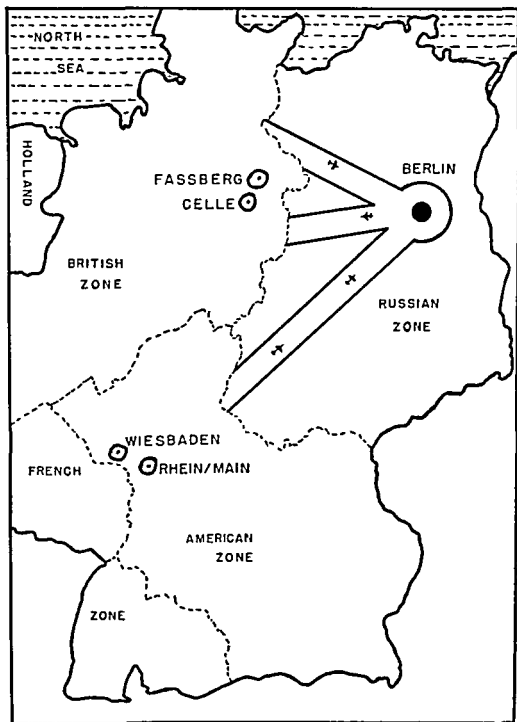


Figure 1.

(d) Other sanitary problems. On occasions the laundry facilities were inadequate. Many Airlift personnel complained of the complete absence of drinking fountains at all bases. Such problems as providing suitable garbage racks, repairing floors, painting walls, and screening doors and windows were constantly arising.

*Troop housing*—The doubling and tripling of personnel quartered at Wiesbaden and Rhein Main Air Bases and the establishment of a troop population at Celle and Fassberg far in excess of housing facilities had a demoralizing effect. Every type of shelter was used and often distant barracks were renovated and occupied. The major problems were

(a) Inadequate rest. There was relatively no segregation of personnel according to the shifts on which they worked. This created a continual traffic, especially in the larger rooms, which made all sleepers subject to frequent disturbance.

(b) Inadequate heat: In many cases attics and hastily renovated structures were used for housing prior to the installation of adequate heat. During the colder months room temperatures were far below desirable levels.

(c) Inadequate lighting, natural and artificial, especially in attics.

(d) Inadequate furnishings: In many instances the number of occupants in a room precluded the installation of any furniture other than double-deck beds. Clothes were hung from rafters and letter writing was practically impossible.

(e) Inadequate latrine and washroom facilities: As a natural consequence of using all possible space for housing, there was a troop population far in excess of washroom and latrine facilities. Complicating this situation was a frequent lack of hot water, as the demand was far beyond the capacity of the water reservoirs or boilers.

(f) Inadequate transportation: The use of housing areas at a great distance from Airlift sites, raised a transportation problem beyond the facilities at hand. This not only caused great inconvenience, but further detracted from Airlift personnel's normal rest and recreational periods.

When conditions were at their worst, such as at Fassberg in the winter of 1948-49, rooms crowded with double-deck beds with no space for wardrobes, chairs, or tables were similar to those found in concentration camps. No base was able to solve the problem satisfactorily, although in the later stages of the Airlift, additional construction alleviated the pressure.

*Dependent housing*—No single aspect of the Airlift was more bitterly protested than the inadequacy of dependent housing facilities. In June 1945 there were barely enough dependent quarters for the

relatively stable USAFE forces. When the USAFE troop population doubled, there was no possibility of housing dependents of all USAFE personnel. Inasmuch as the original Airlift troops arrived on temporary duty, the problem was not acute, but when it became apparent that the length of the tour was going to be prolonged and permanent change of station orders were received, the concern over dependent housing became acute. To offer some type of housing, a relatively large number of resort hotels were renovated for the dependents of Airlift personnel. This in itself, however, posed a serious problem because many such hotels were 100 or more miles from Airlift bases, making it impossible for personnel to see their dependents more than once or twice a month and then at a sacrifice of rest and sleep. The crowded conditions in dependent hotels also constituted a sanitary problem that required constant surveillance. The general effect of the dependent housing situation is indicated by the following comments from the Airlift Questionnaire.

"If personnel who are married have to remain on duty with the Airlift they should be given some consideration and action should be taken to assure that they can have their families with them. If the Airlift is worth anything to the people of the U. S., the least that could be done is to give every man the pleasure of being with his family. If this cannot be arranged, then the Airlift is depriving the personnel of the very thing they stand for, the right to live like human beings under a democracy."<sup>1</sup>

"More convenient housing for dependents would eliminate a lot of worry and mental strain among married aircrew members. The fact that our families are here and we cannot get to see them but about 24 hours out of 2 or 3 weeks does not do a thing for the morale. Our families are stuck in a hotel 100 miles from us. They live out of suitcases and if the insecurity that they are forced to live under is good for small children, I wish someone would explain it to me. I feel that we have been let down by our service very badly."<sup>2</sup>

*Aircraft.*—The Airlift was accomplished chiefly with C-54 aircraft. The C-47's originally used presented no problems other than the maintenance difficulties inherent in using a worn product intensively. The C-54 pilots frequently expressed dissatisfaction of cockpit lighting, heating, and instrument panel arrangement. Although cockpit lighting was investigated, and recommendations were made for improvement, no modification was effected during the Airlift. Opinion as to the most suitable type of earphones was varied and further investigation to produce a more comfortable soundproof earphone is

<sup>1</sup> Questionnaire 527 from a married co-pilot.

<sup>2</sup> Questionnaire 556 from a married engineer.

compute noneffective rates. Because both flying and nonflying personnel at Airlift bases were subject to similar environmental and epidemiologic factors, the report on the disability of flying personnel reflects the disability of the supporting troops. Furthermore, by taking the Care of Flyer Reports submitted by Airlift bases and comparing them with those submitted by other USAF installations, a reasonably accurate comparison is gained as to troop noneffectiveness.

(a) *Personnel removed from flying:* The number of personnel removed from flying at Airlift bases because of disease and injury was many times more than at non-Airlift bases. The percent of personnel removed from flying each month from Airlift bases was generally in excess of 10 percent of the total aircrew strength, as compared to about 2.5 percent at non-Airlift bases. These percents represent number of removals only and do not represent off-duty time for the entire period as there is no accurate method for computing the average time lost for removal.

(b) *Removals for respiratory disease:* The predominant cause of removals was respiratory disease. The number of removals per month at Airlift bases because of these diseases and their complications, were excessive and in general, about five times higher than at non-Airlift bases (fig. 2). Furthermore, the removals for respiratory diseases do not include such complications as aero-otitis and aero-sinusitis.

For comparative purposes, the average flying strength of Airlift personnel was about 4 times greater than that of non-Airlift personnel. Even if incapacities caused by flying at non-Airlift bases was multiplied by 4, they would fall far short of the disabilities encountered at Airlift bases (table 1). Although it has been impossible to obtain facts on the number of persons who sought removal from flying because of subclinical fatigue guised under other symptoms, flight surgeons working with the Airlift stated that the number who requested relief from flying in order to rest or otherwise escape pressure of their duties, was very large, and that it was not unusual to remove persons with excessive physical fatigue under a diagnosis of common cold, or a similar evasive guise.

TABLE 1—Removals for incapacities caused by flying

Diagnosis	Removals at airlift bases	Removals at non-airlift bases
Aero-sinusitis	18	4
Aero-otitis	218	6
Operational fatigue	28	3

(c) *Removals for miscellaneous causes:* While respiratory disease was excessive and fatigue was an appreciable factor, other disabilities

did not materially deviate from normal expectations. Table 2 shows the number of removals during the Airlift for the more common disabilities.

TABLE 2.—Removals of Airlift personnel from flying for miscellaneous causes, 2 July 1948 to 1 October 1949

Cause	Total
Skin diseases.....	62
Hemorrhoids.....	23
Infectious hepatitis.....	23
Aircraft injuries.....	22
Appendicitis.....	16
Peptic ulcer.....	15
Pneumonia.....	12
Tuberculosis.....	4
Hernia.....	3
Total.....	180

*Venereal disease.*—The incidence of venereal disease among Airlift troops was excessive. Fortunately, with modern therapy there was little lost time as the majority of patients were treated on a duty status and periods of removal from flying were brief. Whether or not there have been any undesirable sequela associated with this high incidence cannot be determined at this time, but the fact that the rates were excessive was a cause for concern as it reflected adversely on the morale and discipline of the troops. The chief cause for this high incidence was the fact that persons suddenly removed from their established homes and placed in a new environment made hasty heterosexual adjustments. This is strongly supported by the marked rise in rates when new troops were brought in and the subsequent decline as readjustment took place and better control measures were effected. Also contributing to the high rate was the fact that acceptable recreational outlets were either overcrowded or could not be used because of the shifts on which many persons were working, and until they could have their off-duty time channeled into authorized recreation, there was much time spent in careless sexual pursuits. Another factor was the fact that when bases were expanded and new fields were opened, a large number of camp followers accumulated in the hope of gaining a livelihood from the American troops, self-support being difficult in a war-impooverished nation.

Attempts were made to control the number of transient women in the base areas and to treat those who were infected. Attempts were also made to control exposure but this was difficult. There was great resentment among the troops against any disciplinary measures taken when they were infected with venereal disease, and it is believed that many received treatment from outside sources. It is difficult to esti-

mate what the rate would have been had all patients reported to Air Force physicians. As dependents arrived, and as authorized recreational outlets improved, the recorded rate fell. The incidence of venereal disease in the Airlift appeared to be inversely proportional to morale and stability. Whether or not disciplinary measures were beneficial in its control is a matter of conjecture.

### SUMMARY

The Berlin Airlift was an intensive flying mission undertaken without warning or preparation. There was a lack of housing, aircraft and equipment, and recreational and medical facilities. The effect on the health of Airlift personnel was adverse. The respiratory disease rate was five times as high, and the number of persons removed from flying because of physical disability was four times as high as among non-Airlift personnel. Various incapacities caused by fatigue, maladjustment, and low morale were also unduly high. The logistic demands of the mission required priority over the correction of the environmental problems. As a result, unsatisfactory living and hygienic conditions could not be rectified during the mission although some progress along these lines was being made when the mission ended.

### CONCLUSIONS

1. *Dislocation*—Sudden dislocation of troops from their homes in the early stages of the Airlift resulted in appreciable situational maladjustment. Adequate advance notice prior to transfer in order to take care of personal problems and to provide for dependents is essential to morale and stability.

2. *Overpopulation*.—The sudden increase in troop strength overtaxed housing and sanitary facilities thereby contributing to noneffective rates. Fortunately no major epidemics occurred. The construction of adequate housing and sanitary facilities before occupancy is essential to troop health.

3. *Work schedules*.—The Berlin Airlift was the first major peacetime operation conducted on a 24-hour-a-day, 7-day-a-week basis. Lack of guidance and uniformity resulted in schedules that contributed to fatigue and noneffectiveness. Schedules should be uniform, allow sufficient time off for proper rest and relaxation and should not be changed at intervals of less than 7 days, in order that troops may adapt to changes in sleeping habits. Food, medical, and laundry services should operate on schedules comparable to that of the troops they support.

4. *Recreation*.—The normal recreational outlets of Airlift personnel were blocked through schedules that did not provide for passes of 3 or more days, or did not provide for daylight off-duty time. This

contributed to fatigue, lowered morale, and probably increased the incidence of venereal disease.

5. *Flying*.—Although fear of flying or survival were negligible factors, the physiologic abnormalities of the schedules used and concern over families and personal problems contributed to fatigue, lowered efficiency, and probably contributed to aircraft accidents. Intensive peacetime flying in a low-altitude operation, even under adverse weather conditions, is not in itself detrimental to health or efficiency, provided there is reasonable environmental adjustment and adequate rest and recreation.

6. *Hospitalization*.—The existing medical facilities and personnel were not capable of providing other than dispensary-level care. This resulted in an increased noneffective rate because of the referral of patients to distant sites, and inability to give early attention to symptoms.

7. *Air evacuation*.—Scheduled air evacuation proved superior to on-call flights.

8. *Recording of troop disability*.—In an operation of major magnitude requiring extraordinary effort on the part of participating personnel, there is a point at which loss through fatigue and disability increases faster than productive results. In such a situation troop disability should be charted with logistic accomplishments.





would not have occurred or would not have been fatal without some prior condition such as malnutrition, marasmus, neglect, or ignorance.

### ETIOLOGY

Infant diarrhea is not a pathologic entity, but a miscellaneous group of diseases from known and unknown causes bound together by a common symptom, diarrhea.

*Bacterial agents*.—In addition to epidemics caused by such pathogens as the *Shigella* or *Salmonella*, epidemics have been reported in which so-called nonpathogenic organisms have been incriminated. Among these are *Pseudomonas aeruginosa*, *Proteus morganii*, the hemolytic staphylococcus, Lincefield's group D streptococcus (including *Str. faecalis*), paracolon organisms, and hemolytic strains of *Escherichia coli*. These organisms can usually be found in normal persons but it is believed that almost any organism can cause disease if present in sufficient numbers.

Ensign and Hunter (5) investigated a series of outbreaks of infant diarrhea in a hospital in a fairly large community in Kansas. They noted that 6 of the outbreaks had occurred in the nursery between 1 June and 1 October and involved 24 infants, 9 of whom died. Their study revealed that: (a) the outbreaks were separated by periods of 15, 7, 49, 31, and 10 days, indicating that the infection was being introduced from without; (b) no secondary outbreaks, with one possible exception, occurred in the nursery; (c) a mother or a nurse became ill before each outbreak; (d) every time a mother became ill, her child did also; (e) children on the pediatric ward would occasionally develop the disease; and (f) a generalized epidemic of diarrhea was occurring in the community at the same time.

TABLE 1—Incidence of positive cultures for *Pseudomonas aeruginosa* in an outbreak of diarrhea

	Number	Positive culture
Patients under 2 years of age	34	24
Normal infants under 2 years of age	13	13
Patients examined after death	2	2
Nurses and other employees	103	116

4 of these became ill later.

1 nurse was also a carrier of *Escherichia typhosa*.

Having decided that the infection was being introduced from the community they investigated the water and milk supplies and found that the hospital and most of the community received their milk from two dairies. Investigation of these dairies revealed grossly unsanitary conditions, improper pasteurization, and plate counts of over 7 million bacteria per milliliter. In one of the dairies a water leak,

directly over one of the coolers, was partially controlled by a dirty rag. The water dripped from the rag directly into the so-called pasteurized milk. Cultures from this rag yielded *P. aeruginosa*. Previous cultures from the infected children had yielded the same organism, but little attention had been paid to this fact. The results of thorough bacteriologic study are shown in table 1.

McClure (6) investigated a series of outbreaks of infant diarrhea in hospital nurseries and noted the greater predominance of hemolytic *Escherichia coli* in the sick than in the normal children. Of 42 patients, 15 of whom died, hemolytic *Esch. coli* were found in the stools of 34 and paracolon organisms were found in 21, whereas in 34 normal children *Esch. coli* were found in 2 and paracolon organisms in 8. Four nurses in one institution also harbored hemolytic *Esch. coli* and one of these strains was similar, biochemically, to those isolated from the infected infants. The same strain of this organism was also recovered from a bathing table on which all the infants were bathed. A bacteriologic study of the formula used revealed the presence of a nonhemolytic *Esch. coli*.

McClure attempted to demonstrate the ability of these organisms to produce a toxin by growing them in a semisolid medium, centrifuging to obtain the supernatant fluid which was passed through a bacterial filter, and using the filtrate for testing in cats. His results were not entirely conclusive, but in general the hemolytic strains of *Esch. coli* produced vomiting, diarrhea, and death in a much larger percent of cats than did the nonhemolytic strains. Mice were only slightly susceptible to the toxin, and rats, guinea pigs, rabbits, and monkeys were not susceptible.

Breast feeding is superior to bottle feeding in preventing outbreaks of epidemic diarrhea in the newborn (7). Infants need a normal "fecal-oral" transmission from the mother through breast feeding to establish a normal bacterial flora in the intestines. Aseptic feeding techniques rob the child of these normal coliform organisms, and make the child more susceptible to any pathogen he may encounter. Mayes (7) even advocates the rectal injection of a suspension of the so-called normal flora to prevent outbreaks of this disease.

*Viral agents.*—Although viruses have long been suspected as one of the causes of infant diarrhea, most of the evidence was negative, resting on the absence of a demonstrable bacterial agent, the fact that the infants involved showed a normal or subnormal leukocyte count and that the child failed to respond to chemotherapy. The first positive evidence that a filtrable virus could cause infant diarrhea was submitted by Light and Hodes (8) (9). After attempting to isolate a filtrable agent in a variety of small animals without success, they turned to the calf. Four strains of a virus that caused a bloody,

mucous diarrhea in calves and lasted about 3 weeks were readily isolated. Thirteen percent of the infected calves died. Serial transfers were readily made with all four strains. Specific neutralization of the virus was demonstrated, using the serums of infants convalescing from the disease. Cummings (10) partially confirmed this work by passing the agent serially through five calves before losing it.

Buddingh and Dodd (11) observed an outbreak of infant diarrhea, complicated by stomatitis in about 30 percent of the patients, in which they successfully transferred a filtrable agent to the cornea of rabbits. They differentiated this disease from herpetic keratitis by cross-immunity tests. Buddingh (12) claims to have successfully transmitted the disease serially through 45 passages in the rabbit's cornea. Unfortunately investigators attempting to corroborate this work have not substantiated their findings. Meikeljohn (13) believes that he has duplicated Buddingh's work, but has had little success in proving, by means of the neutralization test, that a virus is present. Cummings (10) found that many nonspecific factors such as trauma, trauma plus alundum, stools and oral washings from normal persons, and various bacteria produce a keratitis in the rabbit's cornea similar to the one described by Buddingh and Dodd.

Lyon and Folson (14) witnessed 3 outbreaks of this disease in a hospital nursery in 1926, 1934, and 1938. During each outbreak, they noted that influenza was prevalent in the community. During the 1938 epidemic, involving 16 infants with 5 deaths, they assumed that the disease was caused by influenza virus and inoculated each of 3 critically ill infants with 30 milliliters of blood from an adult patient convalescing from influenza. All 3 patients improved immediately and, although the diarrhea persisted for several more days, they made an uneventful recovery. High et al (15) noted an outbreak of infant diarrhea that they suspected to be caused by a virus. At the time an epidemic of nausea and vomiting was prevalent in the community. Trying Lyon and Folson's technique, they injected the infants with blood from a convalescent adult patient, but with no success. The only results that have been confirmed are those of Light and Hodes who worked with the calf, a rather cumbersome and expensive laboratory animal.

*Unknown agents.*—Although most of the literature on this subject deals with outbreaks of unknown cause, filth and poor nursing techniques appear to play an important part in almost every outbreak: Diapers were changed just prior to feeding; hand-washing was performed in cold or tepid water or in rinse solutions that contained as many as 7 million bacteria per milliliter, formulas were inadequately sterilized, and many other lapses in aseptic technique were noted.

## CLINICAL FINDINGS

Most cases of infant diarrhea are characterized by (a) severe intestinal intoxication, (b) yellow watery stools, (c) abnormal distention, (d) rapid loss of weight, (e) drowsiness, (f) dehydration, (g) shock, and (h) in moderate to severe cases, acidosis (16). High and his group (15) added a feature that they have noted—a biphasic phenomenon in which the patient may have recurrent bouts of diarrhea and then may suddenly collapse and die. Of the 11 patients in their series who demonstrated this phenomenon, 9 collapsed suddenly and 8 died. Feldman and Anderson (16) found that the average case fatality rate reported for outbreaks of infant diarrhea was 27.8 percent; the range was from 10.5 to 81.8 percent.

## AUTOPSY FINDINGS

Most workers found no significant findings at autopsy. Many noticed a terminal pneumonia or atelectasis and a slight intestinal edema, but unusually little pathologic change for a disease with such a violent course. Christensen and Biering-Sorensen (17) believe that an encephalitis occurs in some patients and have presented the following post-mortem findings: (a) no evidence of intestinal infection; (b) fatty degeneration of the liver; (c) bronchitis and pneumonia suggestive of a general infection with gastrointestinal symptoms; (d) encephalitis; (e) meningitis with no inflammatory changes in the brain; and (f) edema of the brain. The cerebral changes may be non-specific like those of toxic encephalitis found in other diseases (18). Lyon and Folsom (14), who suspected influenza virus to be the cause of their cases of diarrhea, found severe generalized edema of the brain with many pin-point hemorrhages at autopsy. The blood vessels were unusually friable, and the convolutions of the brain were almost flattened by the edema. In the intestinal tract, the mucosa was almost completely denuded and pin-point hemorrhages were present. Generalized atony of the intestine was prevalent.

## FOURTH ARMY AREA MEDICAL LABORATORY PROJECT

We are trying to determine the agents that may cause infant diarrhea. Complete bacteriologic studies and attempts to isolate filtrable agents from cases that are probably caused by viruses are made. Table 2 summarizes our findings on the enteric pathogens. In the group studied thus far no *Shigellae* were isolated from the group 1 to 6 months old. Three children demonstrated central nervous system signs and their infection was thought to be viral. Two of these children died. One was 2 months old and had the typical stomatitis described by Buddingh and Dodd (11). The other was 4 months



# The Clinical Use of Antibiotics

## IV. Treatment of Infectious Processes<sup>1</sup>

PERCIN H. LONG, Colonel, MC, A. U. S.<sup>2</sup>

AT PRESENT the problem of the clinical use of antibiotics in the treatment of infectious disease is complex, and will probably become more so as new and effective agents make their appearance. This means that the medical officer must select with care and intelligence the antibiotic he plans to use for the treatment of any patient, and, in certain instances of disease, he is confronted with the problem of choosing the most effective combination from among several antibiotics. The following recommendations are based on the effectiveness of the drug, its toxicity, the ease of its administration, its cost, and the possibility of the organism becoming resistant.

*Group A hemolytic streptococcal infection.*—The antibiotic of choice is a preparation of penicillin G. Aureomycin is the second most effective agent, with chloramphenicol and streptomycin trailing. For topical use, tyrothricin or bacitracin can be recommended.

*Group B hemolytic streptococcal infections.*—Penicillin G is preferred. Aureomycin is second choice.

*Infections with Streptococcus faecalis.*—Aureomycin is the drug of choice with penicillin second.

*Infections with Streptococcus viridans.*—A preparation of penicillin G is the drug of choice with aureomycin second if the infecting organism belongs to that group of *Str. viridans* that inhabits the rhinopharynx. If the organism belongs to the enterococcal group, then aureomycin is the drug of choice.

*Nonhemolytic streptococcal infections.*—If the organism is an enterococcus, use aureomycin; otherwise penicillin.

*Staphylococcal infections.*—In view of the increasing incidence of staphylococcal infections produced by organisms that are resistant to penicillin, aureomycin is the agent of choice, with penicillin G sec-

<sup>1</sup> The fourth and last of four articles on this subject.

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gastrointestinal illness. The cultures were made as promptly as possible and more often than usual. Of the 5 ships included in the project, 3 were decommissioned prior to the scheduled termination dates of the study: operational plans for another vessel made it impracticable to obtain the last 2 scheduled cultures. The numbers of post-inoculation cultures actually obtained on the cruisers were, therefore, 12, 15, 19, 24, and 26 respectively.

The technical procedures followed and materials employed were described in another article (1). Of importance in the interpretation of results were histories of previous exposure to infection with *S. flexneri* III, ship's division to which a man was assigned, and whether the subject represented an "original" or "replacement" in the project; replacement personnel were those who reported aboard the vessels subsequent to initiation of the program on the ship and such persons were excused from the routine preinoculation studies.

### RESULTS

Five thousand, eight hundred and sixty officers and men were included in the studies of this number, 3,532 (60.3 percent) were originals and 2,328 (39.7 percent) were replacements; this study classification is shown in table 1. There were 106 intership transfers of personnel during the course of the program.

TABLE 1—Study classification of officers and men on 5 cruisers

Ship	Originals		Replacements		Totals
	Number	Percent	Number	Percent	
A	154	55.6	123	44.4	1,177
B	74	58.7	52	41.3	1,275
C	73	57.2	54	42.8	1,294
D	78	63.4	49	36.6	1,117
E	99	68.1	38	31.9	1,027
Total	3,532	60.3	2,328	39.7	5,860

In all, there were 10,518 preinoculation cultures and 86,587 post-inoculation cultures scheduled for the group of subjects, an anticipated total of 97,105 specimens. Actually, there were 8,803 preinoculation, and 75,784 postinoculation, rectal swab specimens taken, or 84,589 cultures examined; these represent 87.1 percent of those scheduled. Of the entire number of specimens taken, 411 cultures positive for either *Shigella* or *Salmonella* were obtained from 190 asymptomatic subjects or 3.2 percent of the study population.

*Asymptomatic carriers of S. flexneri* III.—Of critical importance in the study is the fact that *S. flexneri* III was recovered at least once from 103 subjects, or 54.2 percent of the persons with cultures positive

for the 2 genera previously mentioned; this group of carriers comprises 1.8 percent of the total population studied. The majority of the carriers was concentrated on 2 of the 5 ships: the distribution was Ship A, 9; Ship B, 42; Ship C, 41; Ship D, 6; and Ship E, 5. At the termination of the studies, because of decommissioning, there were 1,955 officers and men still aboard Ships B and C of whom 62, or 3.1 percent, were carriers of *S. flexneri III*. The possible epidemiologic significance of this situation will be discussed later. Two hundred and sixty cultures of *S. flexneri III* were recovered from the group of 103 carriers; that is, 63.3 percent of all positive cultures recovered from 190 subjects were *S. flexneri III*. A summary of the cultural studies of the *S. flexneri III* carriers is given in table 2.

An examination of this summarization reveals some interesting observations. It will be noted that 90 (87.4 percent) of the group were originals; that is, they were aboard when the program was begun. Of particular importance is the fact that 87 (84.5 percent) of the subjects reported their presence in a previous epidemic presumably caused by *S. flexneri III*; 51, or 49.5 percent, of them had been ill at the time of the outbreak, but only 9 of the 103 had records of previous cultures positive for the organism. Of the entire group, 16 (15.5 percent) were detailed to food-handling duties during periods when *S. flexneri III* was isolated from them. Some additional evidence of the intermittent shedding of the organism was obtained; it was recovered only once from 48 subjects but in the remaining group of 55 subjects from whom *S. flexneri III* was obtained 2 or more times the largest number of negative cultures between positives was 21. The highest number of consecutive positive cultures isolated was 7, but from one person there were 12 positive cultures with only 3 negative specimens intervening. From the group of 103 carriers, 1,259 specimens were secured for culturing; of these, 260 or 20.7 percent were identified as *S. flexneri III*. *S. flexneri II* was recovered from 2 men subsequent to the isolation of *S. flexneri III*. From 1 specimen from one of the subjects, a mixed infection of *S. flexneri III* and *S. dysenteriae III* was demonstrated. From another person, *S. alkalescens* was recovered 7 weeks subsequent to the isolation of *S. flexneri III*; no additional positive cultures were obtained from this man in 19 successive attempts.

A careful examination of the case histories of the 16 asymptomatic carriers of *S. flexneri III* who denied being present in a previous epidemic elicited further pertinent information. Nine of them had only recently started their naval careers, their ages ranged from 17 to 19 years, and only 1 had had previous sea duty. Of 8 who had had previous sea duty and whose ages varied from 19 to 34 years, 7 had been aboard ships that either were known to have suffered previous



epidemics or had visited ports where the infection could have been acquired; it was believed that information furnished by the other subject was erroneous and that he was actually present in a previous epidemic. Thirteen of this group of 16 carriers were assigned to ships' divisions in which there was at least 1 other carrier who had been present in a previous epidemic. It is possible to speculate only as to the sources of infection in these 16 men; it is believed, however, that circumstances could have permitted 8 of them to acquire the organism after reporting aboard the ships in the study. Of these 8 men, 3 received parenteral *S. flexneri* III vaccine; the first positive cultures were obtained from 2 men prior to completion of the course of vaccine. The first positive culture from the third man (D 770) was recovered, however, 26 days after completing the course of vaccine. Unfortunately, no preinoculation serum was obtained from this man and consequently no serum mouse protection studies were made; however, agglutination tests with two postinoculation serums showed titers of 640 and 320 respectively, neither of which indicates a significant rise above the "normal" level (4). Two others of this group of 8 had received oral *Shigella* vaccine with intervals of 4 and 11 days after completing the course before the first positive culture was isolated; the other 3 men had received placebos only. A condensation of the data concerning these 16 men is presented in table 3.

TABLE 3.—Historical data concerning 16 men who denied presence in previous epidemics of diarrheal disease

Study number	Age (years)	Study classification	Vaccine		Date entered Navy (month and year)	Date aboard study ship (month and year)	Previous sea duty	Date of first positive culture
			Kind	Date course completed				
A 115*	19	Replacement	Pa 1	11-4-48	6-48	9-48	None	10-25-48
C 13*	19	do	Pa 1	12-16-48	8-48	11-48	None	12-14-48
B 1008	18	do	Or 1	10-21-48	6-48	9-48	None	10-25-48
C 1276	17	do	Or 1	10-21-48	6-48	9-48	None	11-1-48
C 1224	17	do	Pa 1	10-14-48	6-48	9-48	None	12-2-48
C 1070	19	do	Pa 1	9-30-48	2-48	9-48	None	11-1-48
B 881	19	do	Pa 1	10-21-48	10-47	9-48	1947-48	11-21-48
C 922	21	do	Or 1	9-30-48	12-47	8-48	1947-48	12-14-48
C F 463	20	do	Or 1	9-30-48	10-45	9-48	1946-48	11-1-48
A 171	20	Original	Pa 1	5-26-48	7-39	4-48	1945-46	5-12-48
C 252	21		Pa 1	7-6-48	9-45	9-47	1946-47	6-17-48
C 296	22		Pa 1	7-7-48	3-44	7-47	1945-47	10-5-48
C 432	21		Pa 1	7-7-48	5-46	7-46	1946-48	8-10-48
D 770	17		Pa 1	6-2-48	10-47	1-48	None	6-28-48
C 726	28	do	Pa 1	7-26-48	11-47	3-48	None	9-27-48
F 618	34	do	Or 1	7-26-48	1-31	3-47	1945-48	9-1-48

\* Parenteral *S. flexneri* III vaccine

† Oral *Shigella* vaccine

‡ Placebo

*Asymptomatic carriers of Shigella alkalescens.*—Of interest is the number of times *S. alkalescens* was isolated during the studies; it was recovered from 127 specimens taken from 69 asymptomatic subjects. A total of 1,174 specimens for culturing was obtained from these

subjects; the number of cultures positive for *S. alkalescens* represented therefore, 10.8 percent of those taken from this group. From the total of 411 cultures of *Shigella* and *Salmonella* isolated during the studies, those positive for *S. alkalescens* comprised 30.9 percent in contrast to 63.3 percent positive for *S. flexneri* III. *S. alkalescens* was recovered only once from 46 persons, twice from 9 others, 3 times from 7 individuals, and 11 times from 1 man. The greatest number of negative cultures between positives was 16, and the highest number of consecutive positive cultures was 5. Twenty of the sixty-nine persons reported their presence in a previous epidemic (presumably due to *S. flexneri* III) and 7 of them stated they were ill during the outbreak.

*Miscellaneous Shigella and Salmonella types isolated*.—There was a total of 20 cultures of *Shigella* and *Salmonella* types, other than those already mentioned, recovered from 19 different persons. *S. flexneri* II was encountered in 2 consecutive specimens from 1 of these subjects who denied any history of gastrointestinal illness or presence in an epidemic; this type was recovered from another man subsequent to the isolation of *S. flexneri* VIII. *S. flexneri* VII was recovered once from a person who had been aboard a ship during an outbreak in October 1947 and who had been ill for 3 days at that time. *S. rio* (5) was identified in a single specimen from a man who gave a history negative for diarrheal disease or presence in an epidemic. *S. sonnei* was isolated once from 1 subject who had been present and ill for 10 days during a shipboard outbreak in October 1947. Of 12 individuals from whom *Salmonella* types were isolated, 9 denied any history of gastrointestinal illness or presence in an epidemic; the organisms, which were recovered only once from each subject, were *S. anatum*, *S. bredeney*, *S. javiana*, *S. monterideo*, *S. newport*, *S. oranienburg*, and *S. typhimurium*.

*Sporadic cases of gastrointestinal illness*.—During the course of the project, there were 65 sporadic cases of gastrointestinal illness reported from 4 of the 5 ships. A total of 165 specimens taken from 59 cases during illness yielded no cultures positive for *Shigella* or *Salmonella*. Of these 59 subjects, 38 were originals and 21 were replacements; in none of the persons was the illness severe and the average duration was approximately 1.5 days. Only 7 of the 65 sporadic cases were foodhandlers and all 7 were among the 59 with transient illness just described.

Of importance is the fact that from each of the other 6 cases, *S. flexneri* III was recovered on at least 2 days during the illness, with 7 as the maximum number of positive specimens; no other type of *Shigella* or *Salmonella* was encountered in any of the specimens examined. Three of the cases occurred on Ship B and 3 were on Ship C; it is of interest to note that these 2 cruisers had the highest asymptomatic

onset of illness respectively. Unfortunately, no adequate data are available at present to determine whether sufficient immunity should have been developed in these two patients to protect them against infection; further studies are planned in an attempt to collect more evidence on this point. It appears possible that these six cases might have been an indication of impending epidemics on the two cruisers, particularly on Ship C where three cases occurred within 9 days; this question remains unanswered, however, since both vessels were decommissioned shortly thereafter.

Of possible significance is the fact that in these studies there was no definite evidence of failure of the parenterally administered *S. flexneri III* vaccine to produce the desired results; none of the six sporadic cases of illness had received this type of material. Of the eight asymptomatic carriers who could have acquired their infections after reporting aboard the study ships, three had been given the vaccine subcutaneously, from two of these, however, the first positive cultures were recovered prior to completion of the immunization process. The first positive culture was obtained from the remaining patient, however, 26 days after the last dose in his course of vaccine; it is possible that this instance represents a failure of the vaccine to prevent infection. It is equally possible that the man had actually acquired his infection aboard the ship prior to being inoculated; there was an interval of about 6 weeks during this period when no specimens were taken from him for culturing. On the basis of data at hand, this case does not represent a failure of the vaccine to prevent illness due to the infection. It is hoped that analysis of data to be collected may provide more adequate evidence concerning this question.

#### SUMMARY

From 5,860 officers and men aboard 5 light cruisers, a total of 84,589 rectal swab specimens was taken before and after administration of *S. flexneri III* vaccines and cultured for members of the *Shigella* and *Salmonella* groups; 411 strains of organisms belonging to these 2 genera were isolated from 190 (3.2 percent) of the personnel studied.

*S. flexneri III*, the *Shigella* type predominantly responsible for recurrent shipboard epidemics in the Pacific Fleet, was recovered 260 times from 103 asymptomatic carriers; this group represents a carrier rate of 1.8 percent. It was shown that about 85 percent of these persons had been present in a previous epidemic of shigellosis at which time the carrier condition presumably was initiated; it was believed that the balance of the group became infected as a result of exposure to organisms excreted by the established carriers. Intermittency in the recovery of *S. flexneri III* from carriers was again observed. The

majority of the carriers (80.6 percent) was concentrated on two of the ships on which six sporadic cases of illness due to this organism occurred just prior to decommissioning of the vessels.

Suggestive but inconclusive evidence was obtained which indicated that the parenterally administered *S. flexneri III* vaccine had produced the desired results; analyses of additional data are planned with the objective of obtaining more definite information on this point.

#### REFERENCES

1. BARNES, L. A.; BENNETT, I. L., JR., and GORDON, R. S.: Field trial of *Shigella flexneri III* vaccine; background, scope, and organization of the program. U. S. Nav. M. Bull. 49: 757-774, July-Aug. 1949.
2. PHILBROOK, F. R.; BARNES, L. A.; MCCANN, W. J., JR., and HARRISON, R. R.: Prolonged laboratory observations on clinical cases and carriers of *Shigella flexneri III* following an epidemic. U. S. Nav. M. Bull. 48: 405-414, May-June 1948.
3. FLETCHER, W., and MacKINNON, D. L.: Special Report Series No. 29. His Majesty's Stationery Office, London, 1949.
4. BENNETT, I. L., JR.; GORDON, R. S., and BARNES, L. A.: Field trial of *Shigella flexneri III* vaccine; serum agglutination studies. J. Infect. Dis. 85: 180-194, Sept.-Oct. 1949.
5. WEIL, A. J.; DEANIS, A.; and SLAFKOVSKY, H.: *Shigella* flexneri, new type of *Shigella*. J. Immunol. 58: 23-26, Jan. 1948.



are not aware of three types previously being isolated from one patient. The man from whom the organisms were isolated had had an attack of dysentery 10 weeks earlier but had not been hospitalized. It is possible that he was harboring one or more of the types in the interim and had been the victim of a reinfection at a later date. Since multiple infections can confuse any definitive epidemiologic studies, the value of selecting several colonies for study is evident. Three subsequent stool specimens, taken at 4-day intervals following sulfonamide therapy, revealed only the Types I, III organism, although 20 or more colonies were selected for study.



# Mental Reactions of the Airborne Soldier

ROBERT BERNSTEIN, *Captain MC P S A*<sup>1</sup>

THE airborne soldier is a volunteer. For this reason, it is often assumed that any basis for unwillingness or fear of parachute jumping is eliminated. In this connection it is interesting to note the reasons offered by troops volunteering for the airborne ranks: (a) Some seek parachute training out of curiosity; (b) some undergo the training as a challenge, to see if they are able to complete it; (c) many men seek the training solely to earn the extra pay offered; (d) a small group desire to become airborne for the sake of prestige, the reasons being vague in details but strongly felt; and (e) many men ask for airborne training under the strong influence of a relative, friend, or even a recruiting officer. This last group appears to furnish the greatest number of jump refusals, as well as most of the psychogenic problems encountered.

The initial test of the airborne soldier's ability to maintain emotional stability begins the first day of his training when he commences a long period of fatiguing physical conditioning. This conditioning is purposely emphasized in order to "separate the men from the boys." It is during this stage, while the student is laboring over his fiftieth "push-up," that his instructor offers the consolation, "It's all a matter of mind over matter. We don't mind and you don't matter." It is also during this stage that word "quitter" is first brought into the man's working vocabulary. This word serves as a means of branding vividly the man who chooses to discontinue parachute training, and is held over his head throughout the rest of his airborne life. This attitude plus the hazing practiced make it difficult for a man to consider discontinuing his training, once he has begun. Thus many an impressionable young man continues his training in order to avoid the chagrin and disrespect showered on a quitter and thereby unsuitable candidates may be forced into the airborne ranks. This unsuitability may

<sup>1</sup> 11th Airborne Division

a general feeling of tension. A soldier undergoing such an experience, may appear calm, or the increased tension may be obvious. This tension differs with each person, and is essential in maintaining the proper degree of mental acuity. Regardless of whether one admits being afraid, the previously described sensations, at least in part, are experienced by all. The tension produced and the tremendous amount of energy thereby expended bring to light a serious problem. Parachute jumps in training, and even more significantly in combat, usually take place about dawn or earlier. This is usually necessary for tactical purposes and because ground winds are apt to be less active at that time. This necessitates waking the soldier at 0200 or 0300 hours. Rarely can one adequately compensate for this loss of sleep. This factor alone jeopardizes the high standard of physical stamina sought in the soldier, but when coupled with the tremendous energy drainage resulting from the anxiety and tension present, the soldier is apt to be considerably beneath his normal physical status. In fact, on completion of the landing, the man experiences profound fatigue. For this reason, he often must be driven to vacate the drop field and assemble with the other troops. This is not a desirable situation because his most important tactical duties follow the actual jump. In other words, the stress of the jump and fatigue produced often cause the soldier to believe that his task is completed as soon as he lands on the ground. Further study and consideration of this problem is indicated. The development of means of preventing the condition discussed as well as means of revitalizing the soldier after landing presents a distinct challenge to the field of airborne medicine.

#### SUMMARY

Paradoxically many emotionally immature or unstable soldiers improve their personalities and bolster their confidence by completing parachute training. They are, however, usually poor risks and it is much safer to overlook certain physical deficiencies than any clinically significant emotional defects.



# Adenocarcinoma of the Second Portion of the Duodenum

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LESS than 450 cases of carcinoma of the duodenum had been reported in the literature through 1946. A case which was diagnosed roentgenologically prior to operation, and illustrates the difficulty of definitive management after the diagnosis was suspected, is presented.

## CASE REPORT

A 33-year-old white man was transferred to this hospital from the European Command on 31 August 1948 complaining of pain in his abdomen, weakness, lack of appetite, and intermittent fever. He had been in good health until June 1947. At that time he noticed a burning pain in the left upper abdominal quadrant that was aggravated by ingesting fruit juices, spicy or greasy foods, and by smoking. The pain was relieved by antacids. In October he was admitted to a general hospital in Europe for gastrointestinal studies. The roentgenograms suggested a diagnosis of gastritis. Early in November, after symptomatic improvement, the patient was returned to duty.

He was admitted to a station hospital in May 1948 complaining of anorexia and cramplike pains high in the right side of the abdomen, precipitated by ingesting food. Roentgenograms again showed gastritis. At this time the erythrocyte count was found to be low. The patient was given a bland diet, tincture of belladonna, and barbiturates. Because his symptoms had become worse and he had lost 35 pounds within the year he was transferred to a general hospital in July for further study. Here a gastrointestinal series demonstrated a 25 per cent retention of the barium meal on the 4-hour roentgenogram and he was returned to the United States.

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proved discouraging. Berger and Koppelman<sup>4</sup> reported 5-year cures in only 5.2 percent. Carcinoma of the duodenum is a disease that must be kept in mind if these patients are to be sent to the surgeon while they are still operable.

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<sup>4</sup>BERGER, I. and KOPPELMAN, H. Primary carcinoma of duodenum. *Ann. Surg.* 116: 738-750, Nov. 1942.



# Isolated Fat Replacement of Body and Tail of Pancreas

## Report of a Case

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**A**N INSTANCE of virtually complete fat replacement of the body and tail of the pancreas with only a few scattered islands of Langerhans present, in association with a normal pancreas at head and neck, was observed at autopsy on an obese diabetic man. Reference to the literature (1) (2) (3) (4) revealed only four cases all in children, in which the acinar tissue of the pancreas was entirely replaced by adipose tissue. In our patient the fat replacement was limited to a portion of the pancreas, and it is this unique feature which prompted the following case report.

### CASE REPORT

*Clinical summary.*—A 75-year-old Negro was first admitted to the hospital in October 1943 because of an infection in the small toe of the right foot. He had been diabetic for several years and also had senile dementia. The infection in the toe progressed in spite of conservative therapy so that in November a supracondylar amputation of the right leg was done. Arteriosclerosis with occlusion of the popliteal artery and one of its branches was found. Healing of the stump was uneventful.

In the late summer of 1944, the left foot became similarly affected. The infection progressed despite conservative therapy and in September 1944 a supracondylar amputation of this limb was performed. Pathologic changes similar to those in the right leg were found. Again recovery was uneventful and the stump healed well.

Insulin requirements were described as "moderate" except during episodes of infection. An episode, described as a possible cerebrovascular accident, characterized by stupor, stiff neck, and inability to speak, occurred in March 1946. The patient recovered within a few days. In January 1947, albuminuria with casts occurred and continued until death. There were frequent episodes of watery diarrhea during his hospitalization. The clinical diagnosis of intercapillary glomerulosclerosis was considered although no definite hypertension was present.

The patient's mental condition gradually deteriorated. On 21 January 1948, his insulin requirement suddenly increased, bronchopneumonia had developed,

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the resection of the antrum and sparing all of the teeth, a wide resection of the lower nasal wall, including the entire inferior turbinate, was performed. A large opening into the nose was left, and the opening in the anterior wall of the antrum was closed by approximating the mucosa with interrupted silk sutures. Then through an external fronto-ethmoid-sphenoid approach on the right side, an attempt was made to resect all affected areas. However, the lesion had spread from the frontal sinus to the floor of the anterior fossa of the skull and no further surgery was indicated. The ethmoid labyrinth was then resected, leaving the middle turbinate intact. The firm tumor involved the entire ethmoid labyrinth and extended posteriorly to involve the sphenoid. Surgery was not extended beyond the ethmoid capsule because the uselessness of further intervention was quite apparent by this time. A poor result was expected from the operation because complete removal of the lesion was not accomplished in any direction.



Figure 1.—Proliferation of fibrous tissue, with a tendency to abort, about which are bony lamellae.

The tumor tissue everywhere was quite firm, resembling somewhat the type of bone encountered in a sclerotic mastoid in a young child. A gritty sensation was imparted to the curet.

Histologic examination revealed dense fibrous tissue undergoing metaplasia with osseous tissue and adult bone formation. A diagnosis of spongy osteoma, probably representing an advanced type of ossifying fibroma, was made (figs. 1, 2, and 3).

Convalescence after the operation was complicated by lacrimation from the right eye, evidently caused by interference with the nasolacrimal duct, and by a prolonged discharge from an oro-antral fistula which developed in the anterior wall of the antrum. A small piece of iodoform gauze was eventually recovered from the posterolateral recesses of the antrum, and the foul discharge ceased.

The lacrimation however, persisted for a long time in spite of dilatation of the nasolacrimal duct, and the use of mildly bacteriostatic collyria.

On 7 September 1949 the thickened and moderately deviated nasal septum was resected and a submucous resection of the right middle turbinate was performed. It appeared to be undergoing bony enlargement, was performed. Convalescence was uneventful. The histologic examination of the bone from the middle turbinate revealed the same type of fibrous tissue metaplasia with bone formation similar to that found in the specimens removed from the right maxilla and frontal bones. A diagnosis of spongy osteoma or ossifying fibroma was offered by the pathologist. Surprisingly enough, specimens of bone from the nasal septum showed the same pathologic changes whereas specimens of septal cartilage were normal except for one small area where there was minimal replacement of cartilage by fibrous tissue.

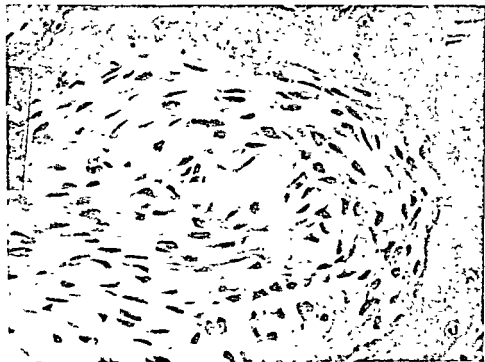


Figure 2.—Detail of figure 1. Note the abundant collagenous tissue.

Healing of the mucous membrane remnant of the right middle turbinate proceeded rapidly. The patient then had very few complaints. However, because all tissue that had been removed had shown actively proliferating osteoblasts, and because the involved areas of the skull were located in regions where vital structures could be interfered with, it was apparent that all efforts should be directed toward arresting the local proliferative process. On the advice of the consultant,<sup>1</sup> a daily dose of 25 mg. testosterone with calcium in oil was given to the patient by intramuscular injection. After 2 weeks of this therapy there was an increase in the sexual libido but this leveled off as treatment continued. There was an increase in the pubic escutcheon and some scattered hairs appeared on the chest.

<sup>1</sup> Dr. Charles F. Geschickter, Consultant in Pathology to the Naval Medical School, National Naval Medical Center, Bethesda, Md.



*Figure 3.—In the center there is a membranous bone formation in an area of proliferating connective tissue. In the lower right-hand corner is older bone.*

On 4 October 1949 the mucosal remnant of the right middle turbinate was removed. On histologic examination metaplastic bone formation was noted in the dense fibrous tissue. The pathologist suggested that this might represent a diathesis in which connective tissue metaplasia to bone occurred as a result of trauma. No further surgery has been done following this report.

At the present writing the prominence of the right half of the face is less than it was on admission. The patient is asymptomatic and blood chemistry and urinalysis are normal. If this condition is a localized disarrangement of collagenous tissues, it may be desirable to use the ACTH factor or cortisone if any further evidence of growth is noted.

# Complications of Meckel's Diverticulum

## Report of Nine Cases

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PHILIP D. CRONMILLER, *Lieutenant, MC, U. S. N.*

EARLY descriptions of intestinal diverticula were made by Haldanus in 1598 and by Lavater in 1671. Fredericus Ruysch in 1707 gave us the first description of a diverticulum of the ileum. Morgagni in 1769 described intestinal diverticula and probably was the first to ascribe to them a congenital origin. Meckel, in three articles (1808 to 1815), discussed the embryology and significance of the diverticulum which bears his name.

### INCIDENCE

It is estimated that Meckel's diverticulum occurs in from 1 to 3 percent of all persons.<sup>1-3</sup> Howell<sup>4</sup> gives these figures from 1934 to 1944 at Duke University: Of 122,490 admissions there were 61 Meckel's diverticula, an incidence of 0.05 percent. In 3,522 autopsies a Meckel's diverticulum was discovered 3 times, an incidence of 0.08 percent. Howell's patients ranged in age from 4 months to 61 years with 50 percent in the second decade; this coincides with the findings of most authors. Meckel's diverticulum is three times more frequent in males than in females.

### EMBRYOLOGY

At about the third week of embryonic life, the embryonic disk, on cross section, occupies about one-fourth of the circumference of the

<sup>1</sup> HARR, J. J. Meckel's diverticulum; review of literature and analytical study of 27 cases with particular emphasis on bowel obstruction. *Am J Surg* 73: 468-485, Apr 1947.

<sup>2</sup> CHRISTIE, A. Meckel's diverticulum, pathologic study of 63 cases. *Am J Dis Child* 42: 544-553, Sept 1931.

<sup>3</sup> GOODMAN, B. A. Meckel's diverticulum; its incidence and significance in routine operations on abdomen. *Arch Surg* 36: 144-162, Jan 1918.

<sup>4</sup> HOWELL, L. M. Meckel's diverticulum, consideration of anomaly, with review of 61 cases. *Am J Dis Child* 71: 365-377, Apr 1946.

yolk sac. As development continues, with elongation and infolding of the embryonic disk, part of the yolk sac is incorporated within the embryonic disk forming the intra-embryonic portion of the yolk sac which later becomes the alimentary tract. With continued infolding of the embryonic disk and the rapid growth of adjacent structures the remaining (extra-embryonic) portion of the yolk sac becomes differentiated from the intra-embryonic portion and diminishes in size. With further growth of the surrounding structures the body stalk forms and later develops into the umbilical cord. In this process most of the extra-embryonic portion of the yolk sac becomes transformed into a tube called the vitelline duct or yolk stalk lying within the umbilical cord. By the sixth or seventh week the vitelline duct (yolk stalk) usually undergoes complete obliteration up to its intra-embryonic connection with what later becomes the small intestine. However, in about 3 percent of cases continuation of the intra-embryonic portion persists as a diverticulum from the small intestine. Meckel's diverticulum, situated about 3 or 4 feet above the ileocolic junction

### ANATOMY

A typical Meckel's diverticulum is 5 cm. in length, cylindrical in form, with a tapering tip and a broad base about the size of the lumen of the ileum. It is situated in the terminal ileum, about 20 inches proximal to the ileocecal valve, opposite the mesenteric attachment. The blood supply may come either from the adjacent intestinal wall or through an independent mesentery of its own.

Variations from this typical picture are infinite. Meckel's diverticulum has been described as varying in size from a tiny out-pouching to a huge viscus, filling half the abdomen.<sup>5</sup> Some investigators believe that these giant diverticula are remnants of both the yolk stalk and yolk sac. The distance from the ileocecal valve has been reported as varying from a few centimeters to 192 centimeters, and has been described as occurring in duodenum, jejunum, and colon, as well as throughout the ileum. It has been described as occurring on the mesenteric border of the ileum.<sup>6</sup>

### HISTOLOGY

The usual diverticulum is lined with mucosa of the same pattern as the ileum. Often there are nests of heterotopic tissue. Figures on

<sup>5</sup> YATES H. B. Remarkable Meckel's diverticulum. *Brit. J. Surg.* 17: 476-462, Jan. 1970

<sup>6</sup> FILLIS G. E. Intramesenteric Meckel's diverticulum. *Memphis M. J.* 22: 45-46, Mar. 1947

the incidence of this vary and must be interpreted according to the origin of the cases; that is, whether they are discovered at laparotomy or incidentally at autopsy. The usual order of incidence of aberrant tissue is gastric, then pancreatic, rarely duodenal or colic, and very rarely bile ducts.<sup>4</sup> The incidence of aberrant tissue in Meckel's diverticulum varies from 12 to 60 percent, most investigators giving about 16 percent gastric mucosa and 3 to 4 percent pancreatic tissue.<sup>4 7-10</sup>

### PATHOLOGY

The presence of an anomalous Meckel's diverticulum may be considered *abnormal*, but it does not become the concern of the patient or physician until pathologic complications occur.

Cases which occurred over an 18-month period (January 1946 to July 1947) in the U. S. Naval Hospital, Philadelphia, Pa., and reported here, are illustrative of the usual pathologic complications.

### CASE REPORTS

#### *Meckel's Diverticulum as an Incidental Finding*

The anomaly has been found during exploratory laparotomy as an incidental finding, and the ileum should always be examined for its presence.

*Case 1*—A 36-year-old white man was admitted on 15 October 1946 complaining of generalized abdominal pain shifting to the right lower quadrant, nausea, and constipation. His temperature was 100.6° F. Examination of the abdomen revealed tenderness, rigidity, and rebound tenderness in the right lower quadrant of the abdomen. The rectal examination was negative. There was leukocytosis. At operation a gangrenous appendix was removed through a McBurney's incision. A Meckel's diverticulum measuring 2 by 5 centimeters was found and excised 30 inches from the ileocecal valve. Pathologic examination revealed no evidence of inflammation but gastric mucosa was demonstrated.

*Case 2*.—A 34-year-old white man was admitted on 26 May 1947 complaining of generalized abdominal pain which had shifted to the right lower quadrant. There was nausea and anorexia. His temperature was 99° F. Examination of the abdomen revealed tenderness, rebound tenderness, and rigidity over McBurney's point. There was leukocytosis. At operation, an acutely inflamed appendix was removed through a McBurney's incision. A benign Meckel's diverticulum was found and excised 18 inches from the ileocecal valve.

\* KIDSTON, A. R., and CRAWF, A. R.: Heterotopic gastric mucosa and reduplications of intestinal tract. *Am J Surg* 49: 342-350, Aug. 1940.

\* MATT, J. G., and TIMMONS, P. J.: Peptic ulcer of Meckel's diverticulum; case report and review of literature. *Am J Surg* 47: 612-623, Mar. 1940.

\* GREENBLATT, R. B.; PINSB, E. R.; and CHANET, R. H.: Meckel's diverticulum: analysis of eighteen cases with report of one tumor. *Am J Surg* 31: 287-293, Feb. 1936.

\* THORP, M. M.: Aberrant pancreatic and gastric tissue in intestinal tract. *Arch. Path.* 34: 375-380, Dec. 1944.



*Case 3*—A 26-year-old white man was admitted on 9 January 1947 with a 2-year history of five episodes of right lower quadrant pain lasting for 24 hours. The physical examination and roentgenologic studies were negative. Because he was an officer on independent duty, it was decided to perform an interval appendectomy. At operation a normal appendix was removed. Exploration of the terminal ileum revealed a Meckel's diverticulum with a 1-inch base. The diverticulum was excised and the pathologic examination revealed evidence of chronic inflammation.

### *Hemorrhage and Ulceration*

In melena of undetermined cause, Meckel's diverticulum should be considered, particularly in the presence of negative gastrointestinal studies. Bleeding from ulceration is one of the more frequent complications of this anomaly and often occurs from a peptic ulcer arising in aberrant gastric or duodenal mucosa.

*Case 4*—A 28-year-old white man was admitted on 1 May 1947 with a 10-year history of six episodes of weakness, tarry stools, and an occasional burning sensation in the left upper quadrant of his abdomen. The present episode began 24 hours before admission. Gastrointestinal studies, barium enema, sigmoidoscopic and esophagoscopy examinations were negative for pathologic changes. On admission his red blood cell count was 3,500,000, the hemoglobin 10 grams. His red blood cell count decreased to 2,000,000 before the hemorrhage ceased. After repeated blood transfusions an exploratory laparotomy was performed and a 5-centimeter Meckel's diverticulum was found and resected 20 inches from the ileocecal valve. The pathologic examination revealed a peptic ulcer in aberrant gastric mucosa. A 2-year follow-up showed complete postoperative relief of previous complaints.

### *Inflammation*

Meckel's diverticulitis is difficult to differentiate from acute appendicitis and when there are insufficient appendiceal pathologic changes to account for the clinical findings a careful search should be made for a Meckel's diverticulum.

*Case 5*—A 19-year-old white man was admitted on 17 September 1946 with a 4-day history of right lower abdominal pain, diarrhea, and vomiting. There was some dysuria. The physical examination revealed generalized abdominal muscle guarding with right lower quadrant tenderness and rebound tenderness. Hyperperistalsis was present. The white blood cell count was 5,700 with a normal differential count. He was observed for several hours, but when his symptoms increased, an appendectomy was performed through a McBurney's incision. A normal-appearing appendix was removed. Eighteen inches from the ileocecal valve an acutely inflamed Meckel's diverticulum with the tip adherent to a loop of ileum, was found and excised. The pathologist's report revealed a normal appendix and acute Meckel's diverticulitis.

*Case 6*—An 18-year-old white man was admitted on 10 December 1946 with a 12-hour history of periumbilical pain localized in the right lower quadrant of the abdomen and nausea. There was a history of three previous episodes which subsided spontaneously. The physical examination revealed rigidity, tenderness, and rebound tenderness over McBurney's point and rectal tenderness high on the right side. The white blood cell count was 9,600 with 2 percent band forms. 73

percent segmented forms, and 19 percent lymphocytes. A preoperative diagnosis of acute appendicitis was made. At operation a normal appendix was removed. Twenty-four inches proximal to the ileocecal valve an acutely inflamed Meckel's diverticulum, 4 inches in length and with a broad base equal to the lumen of the ileum, was found and excised. The pathologist's report revealed a normal appendix and a Meckel's diverticulum showing acute inflammatory changes.

### *Obstruction*

The attachment of the anomalous diverticulum to other structures has frequently resulted in the complication of intestinal obstruction and often with strangulation of the involved intestine.

*Case 7.*—A 28-year-old white man was admitted on 20 March 1946 with a 12-hour history of severe abdominal pain localized in the right lower quadrant of his abdomen. He had vomited once and was constipated. Physical examination revealed rigidity, tenderness, and rebound tenderness in the right lower quadrant. The rectal examination showed tenderness on the right side. The preoperative diagnosis was acute appendicitis. At operation a normal appendix was removed. About 20 inches from the ileocecal valve was a Meckel's diverticulum, the tip of which was adherent to the mesentery of the ileum. Through the loop thus formed had passed several segments of small bowel which had become twisted and obstructed. The obstruction was relieved by freeing the tip of the diverticulum. The diverticulum was resected. The pathologist's report showed aberrant gastric mucosa in the tip of the diverticulum.

*Case 8.*—A 23-year-old Negro was admitted on 5 July 1947 with a 15-hour history of periumbilical cramplike pain shifting to the right lower quadrant 6 hours after its onset. There was nausea, vomiting, and constipation. Physical examination revealed rigidity, tenderness, and rebound tenderness in the right lower quadrant of the abdomen with rectal tenderness on the right. The white blood cell count was 11,000 with a differential Schilling's shift to the left. The preoperative diagnosis was acute appendicitis. At operation a normal appendix was found and further exploration revealed a Meckel's diverticulum whose tip was adherent to the posterior peritoneum. A partially obstructed segment of small bowel was incarcerated in the internal hernia thus formed. The obstruction was relieved by freeing the tip of the diverticulum. At this point the patient's condition became very poor and resection of the diverticulum was deferred. The postoperative course was uneventful and the patient was discharged and returned in 3 months for elective excision of the diverticulum.

### *Intussusception*

Intussusception with a Meckel's diverticulum as the causative factor is more common in children than in adults. The following case report is interesting in that a careful evaluation of the patient's past history revealed numerous episodes of intussusception with spontaneous reduction.

*Case 9.*—A 30-year-old white man was admitted on 12 May 1946 with a 2-year history of episodes of abdominal pain, borborygmi, and diarrhea. The episodes were of 2 to 4 hours' duration with sudden onset and cessation. After prolonged study he was discharged from the Army with the diagnosis of psychosomatic gastrointestinal disease. Four previous admissions to this hospital revealed no pathologic explanation for these episodes. In 9 gastrointestinal series a normal gastrointestinal tract was reported. The present episode occurred 12

hours prior to admission with severe abdominal pain, distention, nausea, and vomiting. Because of his past experiences, the patient delayed seeking medical care. The physical examination revealed abdominal distention, tenderness, most noticeable in the lower right quadrant with rectal tenderness on the right and a tense mass (which was described as dilated bowel) on the right. Peristalsis was high-pitched and borborygmie. Roentgenograms of the abdomen revealed dilated small bowel with fluid levels. A diagnosis of intestinal obstruction was made and Miller-Abbott intubation was accomplished. The signs of obstruction increased and his white blood cell count suddenly rose from 13,500 to 26,600. At operation a non-reducible intussusception of the terminal ileum into the colon was found and a right hemicolectomy with a transverse ileocolostomy was performed. The postoperative course was uneventful. The pathologic specimen revealed a large Meckel's diverticulum which had intussuscepted into the colon. A follow up 2 years later showed the patient to be symptom-free.

Tumors have been reported in Meckel's diverticulum and are usually incidental findings. Those reported are carcinoma, carcinoid, leiomyoma, leiomyosarcoma, fibroma, sarcoma, and benign polyps.<sup>11-16</sup>

### *Foreign Bodies*

Foreign bodies have been found in a Meckel's diverticulum causing inflammation and occasionally perforation. Calculi<sup>17</sup> and fish-bones,<sup>12, 13, 15, 19, 20</sup> have both been reported.

### *Incarceration in Hernias*

One of the original descriptions of an ileal diverticulum was made by Lettice, who found one incarcerated in a hernia. They have also been reported as occurring in femoral, ventral, inguinal, umbilical, and crural hernias.<sup>19, 21-23</sup>

<sup>11</sup> COSTICH, K. J. and McNAMARA, W. L. Carcinoma of Meckel's diverticulum: case report. *Ann Surg* 124: 503-507, Sept. 1946.

<sup>12</sup> ALBRITHT, H. I. and STRAUSS, J. S. Primary adenocarcinoma in Meckel's diverticulum. *New England J Med* 226: 142-146, Jan. 22, 1942.

<sup>13</sup> KOTICK, J. D. and BECK, W. C. Perforated leiomyoma of Meckel's diverticulum: report of case. *Surgery* 10: 630-641, Oct. 1941.

<sup>14</sup> SKINNELL, I. C. and WATERS, W. Leiomyosarcoma of Meckel's diverticulum with roentgenologic demonstration of diverticulum: report of case. *Proc Staff Meet., Mayo Clin* 14: 102-107, Feb. 15, 1939.

<sup>15</sup> LOWEN, I. H. Intussusception associated with polyp in Meckel's diverticulum: report of case. *J. M. A. Georgia* 30: 390-391, Sept. 1941.

<sup>16</sup> COLLINS, D. C., COLLINS, F. K., and ANDREWS, V. L. Ulcerating carcinoid tumor of Meckel's diverticulum: case report. *Am J Surg* 40: 454-461, May 1978.

<sup>17</sup> ALLEN, A. W. and DONALDSON, G. A. Meckel's diverticulum containing calculi. *Arch Surg* 50: 286-287, June 1945.

<sup>18</sup> WEINSTEIN, A. A. Fish bone perforation of Meckel's diverticulum. *J. M. Sinal Hosp* 9: 29-32, May-June 1942.

<sup>19</sup> FLEM, R. and LADD, S. T. Left inguinal hernia with acute Meckel's diverticulitis and peritonitis: report of case. *New England J Med* 226: 15-16, Jan. 1, 1942.

<sup>20</sup> TAMM, J. M. Case of acute gangrenous diverticulitis (Meckel's) with perforation due to fish bone. *Mil Surgeon* 87: 728-729, Oct. 1940.

<sup>21</sup> PATTERSON, F. M. S. Incarceration of Meckel's diverticulum in femoral hernia: report of case. *North Carolina M J* 7: 59-60, Feb. 1946.

<sup>22</sup> STROHL, E. H. and McARTHUR, S. W. Incarcerated Meckel's diverticulum in femoral hernia. *Arch Surg* 35: 783-787, Apr. 1970.

<sup>23</sup> EFFLEY, J. L. Meckel's diverticulum in site of ventral incisional hernia: report of case. *Wisconsin M J* 36: 733, Sept. 1937.

## DIAGNOSIS

The preoperative diagnosis of this condition is rarely made. Gastrointestinal series have occasionally revealed the presence of a Meckel's diverticulum, but for the most part the diagnosis is invariably made at operation.

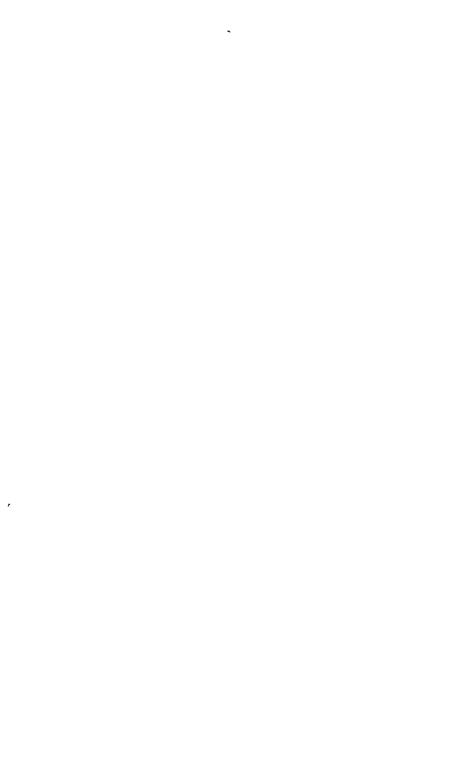
## TREATMENT

The treatment of Meckel's diverticulum with its complications is surgical, the extent of surgery being governed by the pathologic changes found. The diverticulum should be excised. If the base is broad, it may be divided longitudinally and closed transversely to the long axis of the bowel. If the base is narrow, simple purse-string inversion may be carried out without narrowing the lumen of the ileum.

## SUMMARY

Congenital Meckel's diverticulum is subject to various complications, and the treatment is surgical. Our series of nine cases over an 18-month period illustrates most of the complications encountered. It should be reemphasized that in all celiotomies a search should be made for this anomaly, and particularly should the search be made when the pathologic changes found in the appendix are not sufficient to account for the subjective and objective findings.





# Amebiasis and the Complement-fixation Test<sup>1</sup>

CHARLES I. CRAIG, Colonel, MC (Ret.), U. S. A.<sup>2</sup>

IN ORDER to understand what may be expected from the complement-fixation reaction in the diagnosis of amebiasis, one must have a clear conception of this infection. When I first became interested in the condition over 50 years ago, amebic dysentery was the name applied to all infections with *Endamoeba histolytica*. It was believed that this was a disease entity and that all infections were accompanied by a severe dysentery. At that time I was stationed at what is now the Letterman Army Hospital, San Francisco, Calif. Hundreds of our soldiers with amebic dysentery were seen at the hospital on their return from the Philippines. Amebic dysentery was one of the most important infections among our troops in those islands at that time. Unfortunately, the concept that amebic dysentery is a disease entity still lingers and few cases of infection with *E. histolytica* are reported to our boards of health unless the patient has dysentery. Actually, dysentery is but one of the symptoms caused by this parasite and the term "amebiasis" includes all infections with it. Such infections may be symptomless or accompanied by numerous symptoms connected with the intestinal tract or with invasion of the tissues of the body by the parasite.

*E. histolytica* has two principal life cycle stages: (a) a vegetative or trophozoite stage and (b) a cystic stage. In the former, it is actively motile, able to penetrate the tissues of the intestine or other parts of the body through the action of a cytolytic substance, or substances, and by its mobility. The trophozoite state, in which it multiplies by binary division, continues until conditions become unfavorable; then the parasite becomes motionless, spherical, and secretes a cyst wall. These cysts do not undergo full development within the

<sup>1</sup> Presented at the Fourth Army Area Medical Laboratory Seminar on 1 March 1950.

<sup>2</sup> Consultant, Fourth Army Area Medical Laboratory, Fort Sam Houston, Tex.

intestine but are passed in the feces and are the infective agents which, when ingested in contaminated food or drink, liberate eight young trophozoites in the intestinal tract, and the life cycle is repeated. *Cysts do not occur in any of the tissues invaded by this parasite but only in the lumen of the large intestine when conditions become unfavorable for the existence of the trophozoites.*

The pathologic changes produced by *E. histolytica* vary from microscopic excoriations and areas of lysis, caused by the cytolytic substance secreted by the ameba, to extensive necrosis of the tissues and the formation of large ulcers extending to the peritoneal coat of the intestine or amebic abscess of the liver, lung, brain, or other organs, as well as lesions elsewhere in the body, including the skin. The great variation in the severity of the pathologic lesions caused by this parasite, and the variations in the response of the tissues to the infection, account for the apparent contradictions in the results of the complement-fixation test. Thus, one may get a four-plus reaction in patients showing slight symptoms, or no symptoms of the infection, although in a severe symptomatic infection the result of the test may be a weak or even a negative reaction. The severity of tissue invasion cannot be judged by the symptomatology, or lack of it, as it has been shown by several observers that severe lesions may be present in the intestine, even in symptomless infections. Thus, Bartlett,<sup>3</sup> in 1917, described the postmortem findings in 22 soldiers admitted to the hospital for other conditions. Eleven of them had never had diarrhea or dysentery, and were apparently asymptomatic carriers of *E. histolytica*. In all of the latter definite ulcers caused by this parasite were present in the large intestine, some of large size and penetrating to the muscular and peritoneal coats of the intestine. In such latent cases the complement-fixation test would, in all probability, give a positive result, as is the case in a large proportion of latent infections, although in some cases of severe amebic dysentery the reaction may be negative because of the inability of the body to produce complement-fixing bodies when the infection is very severe. There is no lasting immunity in amebiasis and a positive complement-fixation test disappears within 2 to 4 weeks following elimination of *E. histolytica*. Its persistence after this period, even though the parasite has disappeared from the stools, indicates that a focus of infection is still present in the body, perhaps in the liver, to be followed weeks or even months later by an amebic abscess of that organ.

The methods that are available for the diagnosis of amebiasis include the microscopic examination of unstained and stained preparations of

<sup>3</sup> BARTLETT, G. R. Pathology of dysentery in the Mediterranean Expeditionary Force 1915. Quart. J. M. 10: 185-244 Apr 1917.

the stools, using concentration methods, the use of the sigmoidoscope, the cultivation of *E. histolytica* in suitable culture media, and the complement-fixation test. In all suspected cases the stools should be examined for the ameba and if sufficient time be expended and the examiner is trained in the differentiation of *E. histolytica* from the four other species of amebas occurring in the intestine of man, generally accepted as nonpathogenic, and if the examination is repeated several times when the first one is found negative, the parasite will be found if present. This often means the expenditure of much time and money. Sigmoidoscopic examination should be made if the stools are negative but about one-third of the infections may be missed if this method of examination is used alone, especially if there are few or no symptoms, because about one-third of the lesions occur only in the ileocecal and upper portion of the large intestine. Cultivation of *E. histolytica* from the stools should also be attempted routinely and some authorities believe this method of diagnosis is more useful than the microscopic examination of the stools.

Complement fixation is, at present, merely an aid in the diagnosis of amebiasis and should not be attempted until the diagnostic methods previously mentioned have been employed. If we possessed a complement-fixation test that always gave positive results in all infections with *E. histolytica*, and never in other disease conditions, it could be used as a routine diagnostic test to the exclusion of other methods of diagnosis; but unfortunately the complement-fixation test for amebiasis is not perfected at present and does not always give positive results in all infections with this parasite and negative results in all other infections and disease conditions. As with most complement-fixation tests, false positive and false negative results may be obtained.

At present the antigens employed in the test are not made from pure cultures of *E. histolytica* and are always contaminated by bacteria. It has been repeatedly demonstrated that such contamination does not cause false reactions and that complement fixation in amebiasis is a specific reaction; that a positive reaction disappears within a comparatively short time, usually 2 to 4 weeks after the elimination of *E. histolytica* by treatment; that a positive reaction is obtained with antigens made from washed cysts of the parasite; and that positive reactions are obtained with the blood serum of animals immunized to the ameba and from whose blood serum antibodies against the accompanying bacterium in the inoculum employed in immunizing the animals have been removed.<sup>4</sup>

<sup>4</sup> SHERRWOOD, N. P. and HEATHMAN, J. Further studies on antigenic properties of pathogenic and free living amebas; complement fixation in amebic dysentery. *Am J Hyg* 56: 121-136 July 1952.



Employing the technic I have recommended for the test, from 85 to 90 percent of positive results were obtained in symptomatic amebiasis and from 70 to 80 percent in asymptomatic or latent infections. False positive reactions were obtained in some cases of chronic ulcerative colitis but few such reactions have been reported in other diseases. The results obtained with the test by other observers have varied greatly, probably because of variations in technic and the strength of the antigens used. It is a natural inclination, on the part of laboratory workers, to devise individual techniques and this has been notably true of the complement-fixation test for amebiasis; hence it is not surprising that variations in the results obtained with this test have been reported by those who have modified my original technic. Refinements have been made in the technic that were unnecessary and that have led to confusion and a smaller percent of positive results, especially in symptomless infections with *E. histolytica*. Unlike generalized infections, infection with this parasite is usually localized in the tissues of the large intestine and apparently the production of antibodies is much lower and the complement-fixing antibody is present in small amounts, thus making it more difficult to demonstrate its presence by a complement-fixation test. This fact probably explains the negative results obtained in a large proportion of infections with *E. histolytica* by some of the modified techniques employed by certain investigators. In other words, too much refinement in techniques has injured the value of the test as a diagnostic agent in amebiasis.

When a positive reaction is obtained in a suspect, it is justifiable to regard it as strong presumptive evidence that infection with *E. histolytica* is present and treatment should be administered. A negative reaction does not prove that such an infection is absent although such a reaction in conjunction with negative results with the other diagnostic tests mentioned would be conclusive. The permanent disappearance of a positive reaction after treatment and negative stool or other examinations definitely indicates that the parasite has been eliminated and treatment has been successful.

While, as stated, this test cannot, and should not, replace the other methods of diagnosis available in amebiasis, the complement-fixation test possesses a definite value in the diagnosis of this infection. It is most valuable in those infections in which, for any reason, it is impossible to make proper examinations of the stools, but it is also valuable under other conditions. The complement-fixation test has definite practical value in (a) the discovery of carriers or cyst-passers (when used as a routine diagnostic procedure), (b) the diagnosis of amebic liver abscess, (c) the diagnosis of acute and chronic amebic dysentery, (d) the control of the treatment of amebiasis and the

evaluation of drugs used in such treatment, and the efficiency of proposed amebicidal drugs in animals. It is employed whenever possible but never to the exclusion of examinations and cultivation of the ameba.

*The discovery of carriers or cyst-passers.*—In many hospital stool examinations are not made, but blood examinations and a Wassermann test are made on every patient. The complement-fixation test for amebiasis could be made at the same time and such a procedure has resulted in picking up many latent amebic infections in carriers or cyst-passers. This procedure was used at the Army Medical School in Washington while I was stationed there and resulted in the discovery of amebiasis in many asymptomatic persons whose stools would not routinely have been examined. Subsequent examination of the stools of these persons almost invariably resulted in the demonstration of *E. histolytica*, and thus proved the value of the test in the discovery of latent amebic infections.

*The diagnosis of amebic abscess of the liver.*—The complement-fixation test usually gives a strong positive reaction in amebic hepatitis and amebic abscess of the liver, and when it is impossible to make stool examinations, or when the stools are negative for *E. histolytica*, it is of great practical value. Not infrequently an amebic abscess of the liver develops after the elimination of the intestinal infection and in such cases a positive complement-fixation reaction is absolutely diagnostic, and should always indicate proper therapeutic or surgical treatment of the patient giving such a reaction and in whom there are suspicious symptoms of hepatitis or abscess formation.

*The diagnosis of acute and chronic amebic dysentery.*—When, for any reason, it is impossible to examine properly the stool for *E. histolytica*, the complement-fixation test is of practical value in differentiating acute or chronic amebic dysentery from other forms of dysentery. In the majority of patients with dysentery caused by this parasite, the complement-fixation test gives a positive reaction, and when stool examinations cannot be made, this test should be of great value in diagnosis.

*The control of the treatment of amebiasis and the evaluation of the drugs used in treatment.*—A positive complement-fixation reaction usually becomes negative within from 2 to 4 weeks after the elimination of *E. histolytica* by treatment. If it does not become negative, even though the ameba has disappeared from the stools, one may be practically sure that the infection still persists somewhere in the tissues, and this will be proved by the reappearance of the parasite in the stools. In such patients treatment should be repeated and continued until the reaction becomes permanently negative. If used in this manner, the complement-fixation test for amebiasis is of practical

value in controlling treatment and in evaluating the amebicidal properties of the drugs used in the treatment of amebiasis.

*The testing of amebicidal compounds.*—The complement-fixation test may also be used in testing the efficiency of new compounds proposed for the treatment of amebiasis, as animals susceptible to infection with *E. histolytica* can be employed for this purpose and the value of the drug proposed for treatment can be ascertained by its effect on the complement-fixation reaction. We have shown that this is true. By experiments on dogs and the use of the complement-fixation test, it was found that the recommended dose of a well-known commercial compound, used in the treatment for amebiasis, had to be increased at least six times to eliminate the amebic infection in the animals.

This test should never be used to the exclusion of stool examinations and cultivation of *E. histolytica* and it should be limited to laboratories in which well-trained personnel is available. At present the technical difficulties connected with the test, especially the difficulty in securing efficient antigens, precludes its general use, but improvements in this direction will undoubtedly be made and it will become a much more useful diagnostic procedure.



# Medical Service Field Research Laboratory

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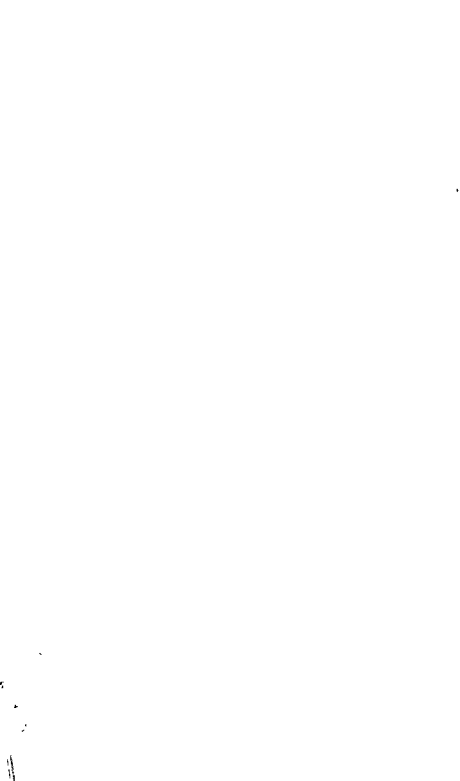
THE Armored Medical Research Laboratory was established at Fort Knox, Ky., 1 September 1942 through the continued efforts of the Surgeon General, U. S. Army, the Surgeon of the Armored Forces, and the Committee on Industrial Hygiene of the National Research Council. The mission of the Laboratory at that time was to study additional physical and mental stresses placed on the soldier in the operation of armored vehicles with a view to improving his comfort and providing additional safety measures to protect him in the performance of his military tasks. Soon after the establishment of the Laboratory it became evident that such a research organization could well serve the entire Army by providing information relative to individual stresses and tolerances of soldiers participating in various military tasks in addition to the operation of armored vehicles. Its mission, therefore, was broadened.

During the war the Laboratory operated under the direct supervision of the Army Ground Forces. At the end of the war the Laboratory was placed under the direct control of the Surgeon General, U. S. Army. The Laboratory was then reorganized and shortly thereafter renamed the Medical Department Field Research Laboratory. The reorganization was based on long-range planning, and civilian scientists were engaged to head all phases of the research activity. Its mission was again broadened with more emphasis being placed on basic physiologic research.

The present mission of the Laboratory is to provide, through research, scientific information on physiologic and closely related problems that may have military significance. Particular emphasis is placed on problems of environment and reaction to stress. Although

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# The British Army Divisional Medical Organization

R. D. CAMERON, *Major General, R. A. M. C.*<sup>1</sup>

THE medical organization within the division consists of (a) 1 Assistant Director of Medical Services (ADMS)<sup>2</sup> and his staff (b) Field Ambulances,<sup>3</sup> three in an infantry or airborne division and two in an armored division; (c) one field dressing station (FDS) per armored or infantry division, also allocated to an airborne division in a ground role; and (d) regimental medical establishments

## ASSISTANT DIRECTOR OF MEDICAL SERVICES

The ADMS, a colonel, is the advisor to the divisional commander on all matters which affect the health of the troops, and this includes advice on health discipline and the prevention of disease. He commands the medical units in the division and is responsible for formulating the medical plan for the collection and disposal of casualties. He is attached to the Adjutant General's branch of the staff and is located at main divisional headquarters. He has 2 medical officers on his staff: A Deputy Assistant Director of Medical Services (DADMS) and a Deputy Assistant Director of Army Health (DADAH). In addition there are 15 noncommissioned officers of the medical corps: 6 clerks, 1 orderly, and 8 sanitary assistants.

## THE FIELD AMBULANCE

All Field Ambulances are standard and are similar in personnel. Field Ambulances with airborne divisions, in view of their special

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<sup>1</sup> Inspector of Training of the British Army Medical Services at the time of writing this article and now Director of Medical Services (Theatre Surgeon), The British Army on the Rhine.

<sup>2</sup> Corresponds to our division surgeon.

<sup>3</sup> Corresponds to our old collecting company or a combination of the collecting section of a regimental medical company and a section of an ambulance company under our new T/O.

employment, have different types and scales of equipment and a minor difference in transport. A Field Ambulance consists of an HQ, and HQ section, and one company, which is divisible into a small company HQ and three equal sections similar in every way to the HQ section. The sections form casualty clearing posts (CCP)<sup>4</sup> for the evacuation of regimental aid posts (RAP)<sup>5</sup> and are administered by the company HQ. The HQ of the Field Ambulance holds the bulk of the equipment and forms the advanced dressing station (ADS).<sup>6</sup> The Headquarters section assists the ADS or is used for leapfrogging, augmenting, or relieving the company as required. The organization of the unit permits great flexibility.

The primary role of the Field Ambulance is the rapid collection of sick and wounded, the rendering of first aid to casualties, their preparation and classification for further disposal, and the completion of necessary documentation. It is a mobile unit and is not equipped to provide other than the simplest accommodation and essential treatment. When not engaged in active operations the Field Ambulance may hold patients with minor illnesses. This is a secondary role and cannot be undertaken in combat when casualties must be evacuated as soon as they are fit to travel. The Field Ambulances of airborne formations are specially trained and equipped for their special duties. When taking part in an airborne operation each Field Ambulance has two field surgical teams attached to enable the unit to operate independently when it is out of contact with ground forces. As soon as a link-up with the ground forces is made, the normal casualty evacuation procedure is reverted to.

Field Ambulances are divisional troops, and as such their disposition is controlled by the ADMS acting under authority of the divisional commander. One Field Ambulance is usually allotted in support of each infantry brigade<sup>7</sup> and then becomes an element of the brigade group, in which case it conforms to the movements of the brigade, and collects the casualties occurring on the brigade front. The sitting, opening, and closing of the ADS's is controlled by the ADMS, except in the initial stages of a planned battle when he frequently delegates his authority to the Field Ambulance commander, in which case the latter will inform the ADMS in advance of any intention to move and at once report the location to the ADMS. In

<sup>4</sup> Corresponds to our collecting post or point

<sup>5</sup> Corresponds to our battalion aid stations

<sup>6</sup> An intermediate unit corresponding to a combination of part of our collecting and clearing stations

<sup>7</sup> Corresponds to our regimental combat team

certain operations the Field Ambulance is placed under the command of the brigade commander, e. g., when the brigade is acting independently in the early stages of an airborne operation. In this event the Field Ambulance commander, with the concurrence of the brigade commander, will locate and open the ADS. He should, if possible, inform the ADMS of his intention to the ADMS and invariably report its location. An ADS may be opened for each brigade in action, or the ADMS may be asked to open one, or possibly two, for the divisional front.

The Field Ambulance commander attends brigade operations and conferences and maintains contact with brigade headquarters throughout operations in order to obtain up-to-date information which will enable him to arrange for the speedy evacuation of casualties. The Field Ambulance commander is the senior medical officer of the brigade, and as such is the advisor to the brigade commander in medical matters. He should frequently visit all units in the brigade area.

The guiding principles in the evacuation of casualties within the division are: (a) the maximum speed consistent with efficiency, limiting treatment to controlling shock and hemorrhage, relieving pain, and rendering the patient fit for evacuation; and (b) minimal handling of the patient such as transfers between ambulances and change of dressings.

*Field Ambulance section.*—The role of a Field Ambulance section is to collect casualties from RAP's and evacuate them without delay to the ADS. It can perform this function either by: (a) direct transportation of casualties from RAP to ADS, (b) establishing an ambulance post at an intermediate point, or (c) establishing a casualty collecting post (CCP).<sup>8</sup> It is often convenient to use two or more sections together thus forming a combined CCP. Prior to an engagement it is usual to attach one or more stretcher-bearer squads from the section to the RAP. If the ground permits, one jeep or ambulance is also attached. Treatment in a CCP should be confined to such first-aid measures as the regimental medical officer (RMO) may have been unable to carry out, and first aid for cases which have not passed through an RAP. It is primarily a check point, and it is only necessary to ensure that hemorrhage is under control and that fractures and large flesh wounds are immobilized. Dressings and splints should not be removed unless such a procedure is essential before further evacuation. Hot sweet tea should be available. When there is an extended line of evacuation there may be occasions when it is necessary to assign to the CCP its additional role of a treatment center. These occasions should be rare. The main object is to transport casualties to the ADS as quickly as possible.

<sup>8</sup> Corresponds to our collecting post or point.



*Field Ambulance company headquarters.*—The role of the company headquarters is to control, administer, and maintain the three company sections. In addition, the company commander controls and coordinates forward evacuation from RAP's and locates CCP's under the Field Ambulance commander's direction. The company commander frequently visits RMO's and maintains contact with the brigade headquarters staff. The company headquarters is located where it can best control evacuation from the brigade group. This is normally at the junction of the lines of evacuation from which all sections are operating. It is not intended to form a medical post but a small amount of medical equipment is carried for the treatment of local casualties and sick.

*Field Ambulance headquarters.*—The HQ of a Field Ambulance forms the ADS. It generally operates under the control of the ADMS division, but may occasionally be placed under the control of the brigade commander. In the former case, it will usually be possible for the ADMS to select the site of the ADS only at the commencement of an engagement, particularly in mobile warfare. It will usually be the task of the Field Ambulance commander to select any subsequent site and report this to the ADMS and the brigade commander or commanders concerned. When the ADS serves more than one brigade, the ADMS controls its movements and issues orders to the Field Ambulance commander accordingly giving the approximate area in which to open, and the time for opening. When the unit is under the control of a brigade commander, the Field Ambulance commander normally selects the site of the ADS in conjunction with the brigade staff.

*Advanced dressing station.*—The role of the ADS is to receive casualties from one or more brigade fronts, through the CCP's, or directly, and to provide essential treatment in order to render the casualties fit for evacuation as soon as possible. Speed in passing wounded through the ADS is essential. The ADS is the main medical center in the brigade or divisional area and is formed by the HQ of a Field Ambulance. It is equipped to provide only such surgical treatment as is essential to render casualties fit to travel to the casualty clearing station (CCS)\* where major surgical facilities are available. The ADS is equipped with shelters and tents for the accommodation of casualties. It can accommodate 150 patients. It may be wholly under canvas, but the use of buildings when suitable and available is a great advantage.

An ADS would be located on, or adjacent to, good roads and requires:

\* Corresponds to the patient holding element of our clearing company.

(e) Pack stores for equipment and arms.

(f) Reserve of splints, dressings, blankets, and stretchers.

(g) Accommodation for personnel.

(h) Natural protection against shelling and bombing. When time permits and particularly in position warfare, an ADS should be able to withstand direct hits from small projectiles, and slit-trench protection should be provided. The location of the ADS and all medical posts must be clearly shown by day and night signs. All road junctions in the neighborhood in all directions must be adequately signposted. All signposts must be removed on change of location. Specifically detailed NCO's will carry out signposting as a drill. The staff of an established ADS should be divided into teams so that rest periods can be arranged and additional staff are easily available to augment the ADS when required. The personnel of HQ section, when with the ADS should be incorporated in the teams.

Special care must be taken of the personal effects of casualties immediately on admission. This is the duty of the NCO in charge of the pack store, who will collect, list, pack, label, and seal these articles. Particular attention must be given to money, valuables, rings, watches, *and any articles of sentimental value*. *Similar care must be taken of the personal effects of the dead.* These effects are specially labeled and sent to the second echelon.

The detailed tasks of the ADS are:

(a) Treatment of the casualty: Wet and soiled clothing is removed and the patients are clad in pajamas. They are made as comfortable as possible and kept warm and dry. Hot sweet tea and a hot meal are given to all, except when medical reasons prohibit this. All previous treatment is checked and any omissions rectified. Tourniquets if previously applied are removed. If hemorrhage persists, other methods are adopted for its control, viz., ligature of the artery or the application of pressure forceps, failing which, the tourniquet is reapplied. Sucking chest wounds are closed by temporary means. If a limb is so shattered that it can be severed by a pair of scissors, it is removed to avoid continuance of shock. Pain is controlled by injection of mor-

phine: sedation of exhausted patients is undertaken. Shock is combated by the afore-mentioned methods and the use of plasma. As a rule it is better to avoid transfusion with whole blood at the ADS. If, however, the chances of survival are doubtful without blood transfusion it should be begun and continued as a drip in the ambulance on the journey to the CCS. The time and place for a blood transfusion is normally at the CCS prior to an operation. Every casualty to whom morphine has been administered is marked on the forehead with the letter "M" in grease pencil. Similarly the letter "T" is used when a tourniquet is employed.

(b) Documentation of the casualty: An accurate regimental and clinical record of casualties is a definite responsibility of all medical units through which casualties pass. This record consists of the number, rank, name, unit, and diagnosis of the casualty. It is required so that the next-of-kin can be informed of the casualty as soon as possible. General headquarters personnel, second echelon, are charged with this duty, and to carry it out they depend on the nominal rolls of casualties received from medical units. These rolls are an extract from the admission and discharge book kept by all medical units and are forwarded daily to GHQ, second echelon, by every medical unit in the force. A record of the clinical condition and treatment of casualties in their progress through medical units is necessary so that each succeeding medical unit can adopt the optimum treatment. The first place in the line of evacuation where a permanent record of the casualty can be undertaken is the ADS formed by the headquarters of the Field Ambulance. Documentation must not delay treatment or evacuation of the casualty.

(c) Classification of the casualty. The wounded are placed in one of three priorities according to their clinical condition. Priority 1 includes patients requiring resuscitation and/or urgent operations; e. g., penetrating abdominal wounds, open chest wounds, compound fractures of the femur, extensive lacerated muscle wounds, and severe shock. Priority 2 includes patients requiring early operation and possibly resuscitation, e. g., severe and multiple wounds, compound fractures and head injuries. Priority 3 includes all other wounded. In general these will be sitting patients. Priority 1 and 2 casualties amount to 15 or 20 percent of the total.

(d) Evacuation of the casualty. Priority 1 and 2 casualties are evacuated to the CCS (or to the advanced surgical center if formed). Priority 3 casualties are also evacuated to the CCS except those whose injuries are so trivial that they will be fit to return to duty in a few days. They are sent to the divisional FDS. Patients with severe illness arriving at the ADS are evacuated to the CCS and patients with minor illness including exhaustion are transferred to the divi-



sional FDS. Patients transferred to the divisional FDS by ambulances of the Field Ambulance. All other patients evacuated by ambulances and troop-carrying vehicles of the Field Ambulance company under arrangements made by the Deputy Director of Medical Service, Corps.<sup>10</sup>

### FIELD DRESSING STATION

An FDS consists of a small administrative headquarters and several equal sections which can operate away from the unit HQ but are maintained by the HQ. The sections may operate together, separately, or be used for leapfrogging. An FDS is designed to hold 100 patients, 40 on beds and the remainder on stretchers. The primary role of the divisional FDS is to maintain the fighting strength of the division within the division by holding all minor sick, injured, and mildly exhausted patients. Normally only patients who are expected to be fit for return to duty in 7 days are held. This period may be altered according to the local or general situation. In special circumstances the FDS may be employed in the divisional evacuation plan. The FDS is sited by the ADMS in consultation with the divisional staff and is normally in the rear divisional area and away from gun positions. The FDS possesses shelters and tents, but should be in buildings if suitable and available. Adequate bathing, reading, and other amenities should be provided whenever possible. Evacuation from the FDS to the CCS is by ambulances of the motor ambulance company, and is the responsibility of the Deputy Director of Medical Service, Corps.

Intercommunication between RMO's, sections, and Field Ambulance HQ is normally by dispatch rider or returning ambulance. Between ADMS and medical units it is by dispatch rider, telephone, or radio. Brigade headquarters may also arrange to link up the affiliated Field Ambulance by radio.

### REGIMENTAL MEDICAL ESTABLISHMENTS

In war, each battalion and similar units have a medical establishment consisting of one medical officer and one to six NCO's, according to the unit. One NCO is provided by the unit as the regimental medical officer's orderly. Regimental personnel are detailed as regimental stretcher bearers and are placed under the orders of the RMO. They are distinguished by a stretcher bearer's armband lettered "SB" worn on the left arm. In addition, personnel of the unit are specially trained in water and sanitary duties. A number of smaller units do not carry a medical officer on their establishment but on active service have personnel trained in water and sanitary duties and first aid. In

<sup>10</sup> Corresponds to our Corps Surgeon.

such cases, a medical officer of a nearby unit is appointed as officer in medical charge, in addition to his other duties.

*Regimental medical officer.*—The officer in medical charge of a unit is directly under the control of the administrative medical officer of his formation in professional matters but in other respects he is under the orders of the unit commander. The regimental aid post should normally be in close proximity to the centrally placed unit headquarters to permit access to and from all parts of the unit front. The RAP should afford protection from rifle fire and machine-gun fire and mortar splinters. The exact site must depend on the tactical situation. If possible, the RAP should be accessible to the ambulances of the Field Ambulance. Unit RAP's should not be amalgamated.

In action, the RMO should locate himself at his RAP. It is rarely possible and indeed it is inadvisable for him to proceed further forward, since when he is separated from his medical equipment, he can do little more than a trained stretcher bearer, meanwhile, casualties requiring his expert aid would be accumulating in the RAP. During the battle an RMO can only carry out the essentials of first aid. This includes the control of hemorrhage, the immobilization of fractures and gaping flesh wounds by splints, the commencement of prophylactic treatment with sulfonamides or antibiotics, the applications of dressings, and the administration of morphine. Close liaison between the RMO and the Field Ambulance is essential. Although the RMO should inform the supporting section of any change of location of the RAP, it is the responsibility of the Field Ambulance commander to maintain touch with the RAP by means of his company and section commanders.

# Female Staffing Program in Army Hospital

JOHN T. GRAY, *Captain, MSC, U. S. A.*<sup>1</sup>

THE Army Medical Service has been conducting an experiment in military hospital staffing since 1 June 1949. This staffing experiment was conducted at Murphy General Hospital, Waltham, Mass., until 30 April 1950 when the program was transferred to the U. S. Army Hospital, Fort Devens, Mass., because of the closure of the general hospital.

The idea for the female staffing program originated from experience gained in World War II and from the realization that in the event of another war, mobilization of national resources, including personnel, would most likely be on a greater scale than ever experienced by the United States in the past. Toward the close of World War II it became increasingly difficult to obtain male replacements in Army hospitals in the Zone of the Interior. This situation resulted in a progressively greater use of women in sub- or non-professional fields by the Army Medical Service. This utilization, however, was limited to assignments such as clerk, stenographer, chauffeur, and medical, surgical, and laboratory technicians. Their performance of duty was of such a high standard that it was deemed appropriate by the Surgeon General and the Director, Women's Army Corps to consider the possibility of maximum use of this source of labor in the event of an emergency. Before such a source could be fully exploited it was necessary to determine the extent to which an Army hospital could be staffed by female civilian and military personnel without deterioration in the standards of patient care and treatment. Other aims of the program are to develop female personnel requirements, formulate descriptions of those positions found suitable for occupancy by women, develop a training program which would train women as effective and qualified persons for hospital positions in the shortest possible time, determine the type of women which should be recruited for the staffing of Army hospitals, and to give the Medical Service experience, data, and plans for the use of women immediately available.

Murphy General Hospital was chosen as the site of the program because it was representative of all the activities found in an Army

<sup>1</sup> Medical Plans and Operations Division, Office of the Surgeon General, U. S. Army

hospital and the personnel demands and requirements were closely in line with the personnel availabilities. The Women's Army Corps personnel allocations to the program were, because of the size of the Women's Army Corps, very limited; and had the test been assigned to a larger Army medical installation it would necessarily have had to be limited to certain activities because of the nonavailability of personnel. Further, it was possible through the selection of this hospital as a testing site, to extend the testing program to the U. S. Army Hospital, Fort Devens, Mass., because of the Area Medical Service Plan in effect in that area. Thus, the program covered not only an Army general hospital but a station hospital as well. During the period of the testing program at Murphy General Hospital, 715 beds for the care of general medical and general and orthopedic surgical patients were in use. The patient census during the period of the test at this hospital averaged 67 percent of the authorized beds.

Female military personnel were assigned to Murphy General Hospital as they became available by transfer from other stations or through training installation activities. Male military personnel were transferred from the installation as soon as the female replacements became proficient in their assigned duties. Because of Civil Service restrictions and regulations, male civilian personnel were not replaced but emphasis was placed on the recruitment of civilian women when civilian positions were being refilled. The high point in female assignments was reached in December 1949 when a total of 440 women were participating in the program. For the purposes of the program, the positions in the hospital were divided into those pertaining specifically to its functions as a hospital and those pertaining to its operation as a military post. Of the 301 types of jobs considered at Murphy General Hospital, 210 were in the class of hospital type of activity while the remaining 91 pertained to its operation as a military post.

Operation of the program for 11 months determined that of the 301 types of positions only 54 (24 hospital-type and 30 post-type activities) could *not* be filled successfully by women because (a) the rough and laborious demands of the work to be performed were an important consideration, (b) disciplinary or command jurisdiction over male personnel appeared to call for the ruling hand of a man or a man was required by directive and custom, (c) of duty at isolated or lonely locations, especially at night, or (d) the modesty of the average woman and the sense of delicacy of male patients would make the services of a man desirable.

Decisions as to whether women were qualified to perform satisfactorily the duties of the various positions were reached only after



individual and careful consideration of each position. Positions actually tested, decisions were reached after consideration of reports from supervisors under whom the job was performed, supplemented by inspections and observations. If, after testing, there was doubt as to the suitability of the position for a woman, a board of officers made the decision. If there was no opportunity to test a position by reason of nonavailability of time or personnel, decisions were influenced by the knowledge that the same or a similar position had been successfully occupied by women elsewhere under comparable conditions. A job analysis was sometimes a deciding element when a position could not be tested and more positive evidence was lacking. Suitability of women in all the positions was estimated on the basis of attributes, traits, and capabilities common to the average, not the exceptional, woman. The usual degree of physical strength and sense of modesty was assumed to prevail in all instances.

A review of the available data concerning the female testing program indicates that 84 percent of the positions in a hospital comparable to Murphy General Hospital might be successfully filled by women. The female staffing of the hospital type of activity could be 92 percent female while that of the post type of activity could be 60 percent. These female staffing percentages can be considered sound and practical only when fully trained and qualified female personnel are available. The availability of qualified women will most likely depend on other military and civilian requirements, the location of the hospital, the activity of training installations, and the standards for female personnel recruitment.

The major problem which developed and was prevalent throughout the period of the testing program was that of training. It quickly became apparent that the preponderance of the positions in the hospital could be filled by women who were adequately oriented and trained. While female supervisors were hand-picked at the commencement of the female testing program in order to give it momentum, other women were obtained through normal personnel procurement channels in order to provide more realism and to create a true testing situation. Personnel training was accomplished mainly by "on-the-job" instruction and supervision backed up by periodic formal training. As the women became proficient in their administrative and technical duties, men were released for assignments to other stations. Although this method of training created an over-strength in some areas of the hospital staff, this over-strength was considered necessary in the interest of patient care during the training period.

The housing and welfare of the female personnel were carefully considered. These requirements are somewhat greater for women

- (a) Registration up to the fiftieth birthday.
- (b) Induction up to the fifty-first birthday.
- (c) Priorities for call substantially as follows:

1. Those who participated as students in the Army Specialized Training Program or similar programs administered by the Navy, and those who were deferred from service during World War II for the purpose of pursuing a course of instruction leading to education in medical, dental, or allied specialist categories, who have had less than 90 days of active duty in any of the Armed Forces or the Public Health Service subsequent to the completion of or release from the program or course of instruction (exclusive of time spent in postgraduate training).

2. The same group who have had 90 days or more but less than 21 months of active duty.

3. Those in the professions who have had no service in the Armed Forces or Public Health Service subsequent to 16 September 1940.

4. Those in the professions who did have service since 16 September 1940, and, in general, may be called to duty in inverse ratio to the length of their active service subsequent to 16 September 1940.

(d) Such rules and regulations as the President may prescribe, to permit the deferment of:

1. Persons in the national interest, for reasons of hardship or dependency, or in the maintenance of the national health, safety, or interest.

2. Preprofessional students for continuation in training.

(e) The establishment of a National Advisory Committee to the Selective Service System and the coordination by the Committee of the work of State and local volunteer advisory committees.

(f) Additional pay of \$100 per month for medical and dental officers "of the Reserve components called or ordered to active duty with or without their consent, if otherwise qualified, \* \* \*," but "no person inducted (i. e., as an enlisted man) under the provisions of this Act shall be entitled to (these) benefits \* \* \*."

(g) Transfer between the Armed Services of officers holding commissions in the Medical Services or Corps is authorized with:

1. The officer's consent

2. The consent of the service from which the transfer is to be made

3. The consent of the service to which the transfer is to be made.

The Act further states that "no officer upon transfer to any service from which previously transferred shall be given a higher grade or place on applicable promotion list, than that which he would have attained had he remained continuously in the service to which retransferred."

It is not possible at this writing to comment exhaustively on the potential ramifications of this bill. Some of the problems are foreseeable and these present a challenge to the Armed Forces, to the administration of the Selective Service System, and to the civilian professions in their functions as national and local advisors. Some of these problems which are now receiving the attention of the services are:

(a) Classification of professional qualifications. A method whereby members of the professions registered under this act can be classified as to specialty and as to proficiency within the specialty is prerequisite to proper use by the Armed Forces. Complete ground work was accomplished by the Army in the late years of the last war and in the postwar period which should make this task much easier.

(b) Commissioning in the Reserve components. Since those who do not have Reserve commissions are subject to induction as enlisted men and therefore would not be entitled to the additional pay of \$100 per month, it can be expected that every thinking man in the first, second, and third priorities will early seek Reserve commissions. In order to assure equitable distribution among the three services of these specialists, it would seem to be necessary that commissioning quotas be established which could be raised from time to time as the total is reached by the services.

(c) Call to active duty. If a large number of the registrants covered by this act apply for and obtain commissions in the Reserve components, it is conceivable that the Selective Service System and its advisory bodies will be involved only in registration and classification and that the call to active duty will be made by the Armed Forces in accordance with established procedures for calling Reserve officers to duty. On the other hand, if only a few apply for and obtain Reserve commissions, the Selective Service System may bring the large majority to duty through induction procedures. It is possible that both call to duty by the Armed Forces and induction by the Selective Service System will be required to function concurrently.

(d) Transfers between Armed Forces. On 26 July 1950 authority for transfer between Army and Air Force terminated. Authority for transfer between the Armed Forces has heretofore never included the Navy. With the reinstitution of authority for inter-service transfers, the problem of preventing promotion advantage from accruing

to any retransferee (as prescribed in the Act) probably presents the greatest administrative problem.

(e) Integration of calls of Reserve officers involuntarily or with units within the spirit and intent of the Act. It has been necessary to bring a number of Reserve officers to duty with units and a few will have to be called to duty involuntarily before the Act can be implemented. Some of the officers will have had long service in the last war. There is much logic on the side of retention in the service of the officer who has consented to assignment with an organized Reserve unit because he has been drawing pay and gaining points toward an ultimate retirement carrying monetary value. Steps have been taken, however, to bring on duty as few officers with World War II service as is consistent with military necessity. Nevertheless, the intent of the special act for physicians and dentists and allied specialists is that those who have had World War II service should be required to serve last; thus, some sort of comparatively early separation criteria may be required.

In considering this new legal development, it is appropriate that those in the first priority of the bill should be called for service first because they were sent to professional school by the Army or Navy during the past war in order to assure that adequate numbers of doctors of medicine, dentistry, and veterinary medicine for the Armed Forces and the nation would be available. Thus, they were trained with the understanding that they would render service as might be necessary in their professions to further the war effort. When hostilities ceased, however, those in authority believed that they would not be needed within a reasonable time and they were forthwith released from obligation to service with the Armed Forces.

Now that authority exists to call these persons to active duty, it should be understood that they are the same as other members of their professions. They are patriotic. They desire to render service to the full extent of their capacities. They do not desire to be malassigned. They want to do professional work within the field for which they have been trained. They are individualists. They have pride in their profession and feel that it and they, as members thereof, should be respected by all. They have difficulty in adjusting to teamwork which includes the fundamental concepts of command and authority outside the professions. They are willing and glad to give service now that they know their compatriots will also be required to do so. All of this is understandable to any thinking person.

Improved career management policies of the Department of the Army have been developed over the past few years and are designed to insure full use of all officers. If properly executed, these policies

will be thoroughly satisfactory to both the service and the community. Commanders of all echelons will do well to look at their career management programs over which they have control.

In summary, the first priority professional man with whom to work for the next few years is an enthusiastic physician seeking mental stimulation and unlimited work in his chosen field. He is a person who is self-motivated, self-disciplined, and encourages others to do the same. He possesses the qualities which he naturally

## II. Medical Service in action

PAUL I. ROBINSON, *Brigadier General, MC, U S A*

THE Far Eastern situation has given all of us an opportunity to view objectively the Service of which we are a part. Particularly has it given the Personnel Division an opportunity to adjudge the work of the past 3 years. Career planning, procurement programs, and training programs, all have been combined in the production and excellence of the Army Medical Service.

On 27 July 1950, the one hundred and seventy-fifth anniversary of the founding of the Army Medical Service, the Army Medical Service was engaged, as on the day of its founding, in the care of United States soldiers in combat, but never before has it gone forth so quickly—and never before has it been so well qualified to perform its task.

Within days after the fighting in Korea started, requisition for a large number of medical officers was received. We were able, by the end of July, to make available to the Far East Command their requirements by specialty qualification. Many of those who were sent to the Far East had to be taken from the residency program, but the spirit with which these officers proceeded in record time probably has never been matched in the history of the Medical Service. The same fine spirit was shown by the Medical Service Corps officers who were alerted and sent to the Far East Command on short notice, and by the members of all corps who have subsequently been assigned to the Far East or to units destined for that command. In spirit and in fact, our Army Medical officers today are true descendants of the great men of our earlier years.

Anyone who chooses medicine as a career is an exceptional person. The long years of preparation, the exacting work, the disappointments and frustration do not appeal to a mediocre person. Only a superior

<sup>1</sup> Personnel Division, Office of the Surgeon General, Department of the Army

person embraces the medical profession, and in the words of the Hippocratic Oath promises:

"\* \* \* with purity and holiness I will pass my life and practice my art \* \* \* Into whatever houses I enter, I will go into them for the benefit of the sick, and will abstain from every voluntary act of mischief and corruption, \* \* \*. Whatever, in connection with my professional practice, or not in connection with it, I see or hear, in the life of men, which ought not to be spoken of abroad, I will not divulge, as reckoning that all such should be kept secret. While I continue to keep this oath unviolated, may it be granted to me to enjoy life and the practice of the art, respected by all men, in all times, but should I trespass and violate this oath, may the reverse be my lot."

In short, doctors are an extraordinary group

The same is true of men who choose the Army. An officer does not take a commission for financial gain, which is small, nor for an easy life, which is not the Army life; nor for glory, of which there is little. It is a sincere and able man or woman who qualifies for a commission, then takes the oath "that I will support and defend the Constitution of the United States against all enemies, foreign and domestic, that I will bear true faith and allegiance to the same; that I take this obligation freely, without any mental reservation or purpose of evasion; and that I will well and faithfully discharge the duties of the office upon which I am about to enter."

It is such men and women who make up the Army Medical Service. To them, in the last several years, we have been able to offer excellent additional training. The residency training program in particular has been a boon to the members of the Medical Corps. The other corps also have benefited from the variety of intensive training programs that have been in effect.

When you take such a group and permit them to continue with graduate studies while they gain the experience that Army medicine offers, you cannot help getting a superior product. Such people work and study eagerly and get the fullest benefit from their experience. Good practitioners to begin with, they become better physicians, better nurses, better specialists, better members of our medical team. Thus, the spirit with which our officers are meeting the demands of the Far East emergency is no surprise to us. Nor are we surprised by the efficiency with which those in the Far East Command are handling the medical problems there. The Korean situation has demonstrated to all people the outstanding caliber of the personnel we have in the Medical Service.

Our training programs are now paying dividends, and we do not intend to abandon them. They must of necessity be curtailed during

## CLINICAL DIAGNOSIS

Of 1,000 patients studied at the Lahey Clinic, 406 were found to have nervous problems of clinical importance (2). In 272 patients, the complaints were purely neuropsychiatric; and in 134 a combination of physical and significant neuropsychiatric disorders were found. In this latter group, 39 had independent and unrelated physical and nervous problems; in 73 the physical disorder was aggravated or provoked by a primary nervous state, and in 22 the nervous state was considered to be secondary to the physical disorder.

Yet, on the other hand, to try and single out certain diseases as psychosomatic is futile, as every disease is essentially psychosomatic, because both psychological and somatic factors have a part in its cause and influence its course. Thus, even though a disease may appear to be restricted to a physical disorder, such as tuberculosis, appendicitis, or myocarditis, even these illnesses might be considered to have a mental component. The degree of mental and nervous reaction will depend on the basic personality of the patient as well as other factors, including the seriousness of the illness, the degree of suffering, uncertainty regarding the outcome, interference with work and other plans, and financial loss.

Further analysis showed that of the 406 neuropsychiatric patients there were 3 cases of psychosis and 7 borderline cases, including 5 cases of mental depression. In 75 patients a clear-cut diagnosis of psychoneurosis was made. Of the remaining 321 patients, neither the diagnosis of psychosis nor of psychoneurosis was made.

The diagnosis of a nervous condition should not depend merely on exclusion of organic disease; in fact, 1 in 7 of the above patients had both physical and nervous disorders of importance. Recognition must depend on observation of the characteristic manifestations of the nervous disorder itself. Some of the complaints are pathognomonic, such as globus hystericus and sighing respiration with difficulty in getting a satisfying breath. Signs of nervous tension may be bitten finger nails, flushing of the face, and variable tachycardia. The fatigue resulting from nervous tension has special characteristics. These include variability unrelated to physical activity; it is usually worse in the morning, decreasing after activity. Some patients complain of worries, low spirits, inability to enjoy work and social relationships, difficulty in making decisions, and disturbing mental conflicts. In many patients a background of constitutional inadequacy, and a family history of "nervous breakdown" can be found. The onset of complaints is usually vague, and frequently dates back to childhood.

Among the patients in whom there were nervous and emotional disorders, the diagnosis of psychoneurosis was made in 75 (neuras-

this emergency, but the Surgeon General has stated that it will be continued at a reduced scale during the emergency period and will be reinstated as quickly as possible with those who have already been selected as the first to reenter the program. Meanwhile, each one in the combat zone or in an emergency post here at home, will with confidence, find such service a chance for still another experience and benefit accordingly.







## BOOKS RECEIVED

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- BONE AND JOINT DISEASES, Pathology Correlated with Roentgenological and Clinical**, by J. Vernon Luck, M. S. (Ortho.), M. D., F. A. C. S., F. I. C. S., *Clinical Professor of Orthopedic Surgery, University of Southern California, Attending Physician, Department of Orthopedic Surgery, and Consultant in Orthopedic Pathology, Los Angeles County Hospital. Member, Subcommittee on Orthopedic Surgery, National Research Council. Member, Board of Associate Editors, Journal of Bone and Joint Surgery.* 614 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$16.50.
- KINESIOLOGY**, by Laurence E. Morehouse, Ph. D., *Associate Professor of Physical Education, The University of Southern California. Interim Chief, Performance Physiology Section, United States Air Force School of Aviation Medicine, and Formerly Research Fellow, Harvard Fatigue Laboratory, and John M. Cooper, Ed. D., Associate Professor of Physical Education, The University of Southern California. Formerly Associate Director of Physical Training, Army Air Force Training Command, and Formerly Athletic Coach, University of Missouri.* 475 pages; illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$4.50.
- CLINICAL THERAPEUTIC RADIOLOGY**, U. V. Postmann, M. D., *Editor: Head of Department of Therapeutic Radiology, Cleveland Clinic Foundation. Professor of Therapeutic Radiology, Banta Educational Institute, Cleveland.* 748 pages; illustrated. Thomas Nelson & Sons, New York, N. Y., publisher, 1950. Price \$17.
- CRANIOPLASTY**, by David L. Reeves, A. B., M. D., *Consultant in Neurological Surgery, Santa Barbara Cottage Hospital, Saint Francis Hospital, Santa Barbara General Hospital, Santa Barbara, Calif. formerly instructor in Neurological Surgery, University of Southern California School of Medicine. Colonel, Medical Corps, U. S. A. C. S.* 119 pages; illustrated. Publication Number 20 American Lecture Series, Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$7.
- ENIGMS, GROWTH AND CANCER**, by Vin R. Potter, Ph. D., *Professor of Oncology, University of Wisconsin Medical School, Madison, Wis.* Publication Number 75 American Lecture Series, 64 pages. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$1.85.
- ESSENTIALS OF OPHTHALMOLOGY**, by Roland I. Priddy, M. C., F. A. C. S., F. I. C. S., *Eye Surgeon, Rockford Memorial, Winnebago County and Swedish American Hospitals. Consulting Ophthalmologist, St. Anthony Hospital, Rockford, Ill.* 761 pages. 215 illustrations including 18 subjects in color. The J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$7.50.
- PRACTICAL GYNECOLOGY**, by Walter J. Reich, M. D., F. A. C. S., F. I. C. S., *Attending Gynecologist, Cook County Hospital. Professor of Gynecology, Cook County Graduate School of Medicine. Attending Gynecologist, Fantus Clinic of the Cook County Hospital. Assistant Professor of Gynecology, Chicago Medical School. Attending Gynecologist and Obstetrician, Grant Hospital. Attending Gynecologist, Fox Farm Tuberculous Sanatorium. Consulting Gynecologist, Hazelcrest General Hospital, and Mitchell J. Nechtow, M. D., Associate Attending Gynecologist, Cook County Hospital and the Fantus Gynecologic Clinic. Assistant Clinical Professor of Gynecology, Cook County Graduate School. Associate in Gynecology and Obstetrics, Chicago Medical School. Attending Gynecologist and Obstetrician, Northwestern American Hospital.* 449 pages with 187 illustrations, including 35 subjects in color. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$10.
- DIAGNOSIS AND TREATMENT OF TUMORS OF THE HEAD AND NECK** (Not including the Central Nervous System), by Grant E. Wahl, M. D., D. Sc., F. A. C. S., and James W. Hardnick, M. D., M. S., *From the Departments of Surgery of the School of Medicine, University of Maryland, and the Johns Hopkins University School of Medicine,*



- ESSENTIALS OF MEDICINE, The Basis of Nursing Care**, by Charles Phillips, M. D., A. B., M. D., *Associate Professor of Medicine Boston University School of Medicine*, Robert Dawson Franks *Memorial Laboratory, Western State Physician in Charge of Clinical Laboratories, Massachusetts Memorial Hospital, Attending Physician, Cushing Veterans Administration Hospital and Assistant, American Red Cross*, and Jane Elizabeth Taylor R. N., B. S., *Lecturer, Frances Payne Bolton School of Nursing, Western Reserve University, formerly Nursing Education Consultant, U. S. Public Health Service*, Assistant Professor of Medical Nursing, Yale University School of Nursing, Assistant in Charge of Medical Nursing, New Haven Hospital. 16th edition, revised and reset. 815 pages. 191 illustrations, including 5 subjects in full color. W. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$4.
- BIOLOGICAL STANDARDIZATION**, by J. H. Burn, *Professor of Pharmacology in the University of Oxford*; D. J. Finney, *Lecturer in the Design and Analysis of Scientific Experiments in the University of Oxford*, and L. G. Goodwin, *Member of the Staff of the Wellcome Laboratories of Tropical Medicine*. 2d edition. 410 pages. Illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price \$6.75.
- THE MEANING AND PRACTICE OF PSYCHOTHERAPY**, by V. E. Fisher, Ph. D., *Psychologist and Psychotherapist, Formerly Assistant Psychologist, Worcester State Hospital, Assistant Professor of Psychology and Director of the Mental Clinic, New York University, Washington Square College, Psychologist and Psychotherapist, Idaho State Hospital*. 411 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$5.
- PRINCIPLES OF PUBLIC HEALTH ADMINISTRATION**, by John J. Hanlon, M. S., M. D., M. P. H., *Associate Professor of Public Health Practice, School of Public Health, University of Michigan, and Chief Medical Officer and Associate Chief of Party, Bolivia, the Institute of Inter-American Affairs*. 566 pages. Illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$6.
- TECHNIQUES IN BRITISH SURGERY**, edited by Rodney Mainot, F. R. C. S. 777 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publisher, 1950. Price \$15.
- SIGNIFICANCE OF THE BODY FLUIDS IN CLINICAL MEDICINE**, by L. H. Newburgh, M. D., *Professor of Clinical Investigation, University of Michigan Medical School, Ann Arbor, Mich.*, assisted by Alexander Leaf, M. D., *Instructor in Internal Medicine, University of Michigan Medical School, Ann Arbor, Mich.* Publication Number 69 American Lecture Series. 76 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.
- A TEXTBOOK OF X-RAY DIAGNOSIS**, by British authors, Vol. IV of four volumes. Edited by S. Cochrane Shanks, M. C., F. R. C. P., F. F. R., *Director, X-ray Diagnostic Department, University College Hospital, London*, and Peter Kerley, M. C., F. R. C. P., F. F. R., F. M. R. E., *Director, X-ray Department, Westminster Hospital, Radiologist, Royal Chest Hospital, London*. 592 pages. 573 illustrations. 2d edition. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$15.
- PLASTIC AND RECONSTRUCTIVE SURGERY, A Manual of Management** by Ferrie Smith, M. D., F. A. C. S., *Consultant in Plastic Surgery, Blodgett Memorial Hospital, Grand Rapids, Mich.* 895 pages. Illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$15.

## BOOK REVIEWS

**RADIOLOGIC EXPLORATION OF THE BRONCHES** by S. di Rienzo, M. D., *Assistant Professor of Radiology and Physiotherapy, Chief of the Radiology Department of the Institute of Cancer, The University of Cordoba, Argentina*. Translated by Tomas A. Hughes, M. D., with a foreword by Richard H. Overholt, M. D. 312 pages. Illustrated. Charles C. Thomas, Publisher, Springfield, Ill. 1949. Price \$10.75.

This book should be of value to the radiologist, physician and surgeon because it stresses the assistance of good bronchography in both the diagnosis and precise localization of pathologic lung changes. The fact that the book contains numerous typographical errors and that some of the terminology is strange to the North American student should not detract from its overall value. In the discussion of both normal and pathologic conditions, the dynamics of the respiratory tree as revealed by the bronchographic procedure are continually emphasized. The book is profusely illustrated.

The first few chapters review in some detail the embryology and anatomy of the pulmonary tree, the dynamic characteristics of the normal lung (and cough reflex) and the technique employed in radiographic exploration of the bronchi.

Bronchopulmonary malformations, bronchiectasis, emphysema, asthma, carcinoma and hydatid cysts are extensively discussed. The value of bronchography is overemphasized in the detection of bronchogenic carcinoma; bronchoscopy appears recommended chiefly as a final confirmatory measure and other diagnostic techniques are glossed over. Bronchography is undoubtedly of value, however, in suppurative disease to (a) locate and outline small and otherwise obscure (cavitary) lesions, (b) detect perivascular concurrent disease (such as ectasia), and (c) check the results of treatment.

The book's greatest value is in stressing the versatility of bronchography alone or in conjunction with the usual diagnostic procedures.—*LEO W. HYPER, Jr., M.D., I. S. N.*

**ANUS RECTUM SINUOID COLON: Diagnosis and Treatment** by Harry F. Breen, B.S., M.D., *LECTURER IN PROCTOLOGY, Professor and Head of Department of Proctology, Temple University Medical School and Hospital, Head of Department St. Mary's Hospital, Formerly Associate Professor, Graduate School of Medicine, University of Pennsylvania, Consultant, Rush Hospital for Tuberculosis, National Stomach Hospital, Douglas Hospital, Mercy Hospital, Shriners Hospital for Crippled Children, Paul Kimball Hospital, St. Christopher's Hospital and Nielsen Hospital, Honorary Fellow, Royal Society of Medicine (London), Ambrose Pare Surgical Society (Paris), Piemontese Surgical Society (Turin, Italy), Venezian Surgical Society, Prussian Surgical Society, Miembro Correspondiente, Instituto de Argentina, Sociedad Brasileira de Proctologia, Pan-American Gastroenterologic Society (Lima), Detroit Academy of Surgery, Hullwood Academy of Medicine, Diplomatic American Board of Surgery, Surgery Qualification Board, International College of Surgeons, Member, American Board of Proctology, Director, American Cancer Society, President, American Proctologic Society. 2d edition in two volumes. Volumes I and II. 1127 pages, entirely revised and reset, profusely illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1949. Price \$70.00.*

This third edition includes new chapters on malformations of the colon, megacolon, diverticulosis and diverticulitis, actinomycosis, transplantation

of the transverse colon to the anus with colostomy and preservation of the sphincter musculature, volvulus, and anesthesia and analgesia.

Dr. Bacon's treatise on diseases of the anus, rectum, and sigmoid colon presents the past and current literature concerning the different aspects of this branch of surgery and incorporates his own ideas gained from vast experience. The bibliography is complete. His use of tables (98 numbered and 100 unnumbered) is instructive and effective, particularly in showing differential diagnosis and in comparing results. Treatment, both medical and surgical, is well presented and inclusive.

Abdominoperineal proctosigmoidectomy without colostomy and with preservation of the anal sphincter muscles (the popularly termed "pull-through" operation) is extensively discussed. In presenting the operation, Dr. Bacon states: " \* \* \* It is the desire of the author to render an honest and unbiased opinion of his experience in a group of patients (undergoing 'proctosigmoidectomy') sufficiently large for the reader to judge the merit of such opinion and form his own conclusions therefrom." The author presents the operation only as a part of the armamentarium of the surgeon, and gives definite indications and contraindications for its use.

The Miles operation and seven other "standard" operations, including the Lahey, Mikulicz-Rankin, Lockhart-Mummery, and Hartman anterior resection operations are adequately described. Dr. Bacon gives unqualified approval of Dennis' employment of vagotomy in the treatment of ulcerative colitis; however, this procedure is considered experimental by many, including Dennis.

The detailed and complete chapters on anatomy with emphasis on clinical application and surgical significance show the author to be a master in this field of anatomy.

The numerous illustrations in black and white and in color are, for the most part, superb. Some of the plates would be of greater value if they were larger, especially plate 13, one of the key plates of proctosigmoidectomy. It is believed the illustrations would be more effective and of greater value if each were captioned so that they would be self-explanatory, and if the illustrated steps in operations were printed in closer correlation with the descriptive portion of the text. Figures 653 and 654 seem to be entirely adrift. Figures 636 and 637 are reversed in operative sequence.

All in all this work is a classic and is all that the author intends—a source book of operative procedures on the anus, rectum, and sigmoid colon. It should be in the library of all proctologists and general surgeons, and should be available to all residents and interns.—*Captain E. S. Lowe (MC) U. S. N.*

**ESSENTIAL UROLOGY**, by Fletcher H. Colby, M.D., *Chief of the Urological Service, Massachusetts General Hospital; Assistant Clinical Professor of Genito-Urinary Surgery, Harvard Medical School, Boston, Mass.; Urological Consultant, Lakewood State Sanatorium, Middleboro, Mass.* 580 pages; Illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$8.

This book is a needed addition to our urologic texts in that it is brief, yet thorough, clearly written, and strongly supported by good illustrations. It also brings us up to date on the policies of modern therapy, giving basic principle rather than details. The first part deals with the embryology, physiology, and anatomy of the urinary tract from a clinical rather than from a basic science viewpoint. Residents and candidates for examinations will find it pleasant to read and informative. The second section emphasizes the importance of a well-conducted history and physical examination. A method is presented with pertinent comments. Retrograde and intravenous urography are discussed, present-

ing technic and risks. Part 3 takes up diseases of the genitourinary organs and is the major portion of the book. The anatomic structures are treated in order: kidney, ureter, bladder, et cetera. The general plan is the presentation of an introduction, the pathology, symptoms, diagnosis, and treatment of each disease. These are modified when indicated. The discussion of each disease or subject is followed by a well-written summary of facts and has been condensed beautifully for easy reading. It has an extensive bibliography—Col E C Lowry MC, U S A.

**THE MANAGEMENT OF THE PATIENT WITH SEVERE BRONCHIAL ASTHMA**, by Maurice S. Segal, MD, *Assistant Professor in Medicine, Tufts College Medical School, Director Department of Inhalational Therapy Boston City Hospital, Boston, Mass.* (Publication No 76, American Lecture Series) 178 pages. Charles C Thomas Publisher Springfield, Ill., 1950. Price \$3.50.

This small volume is No. 76 in the American Lectures in Chest Diseases edited by J. Arthur Meyers, University of Minnesota Medical School. It is devoted entirely to a discussion of severe bronchial asthma, and the recommendations for treatment are based on the author's series of over 700 patients. The book begins with a discussion of the clinical concept of bronchial asthma, followed by an explanation of the allergic concept. The author stresses the fact that there is no clear-cut division between extrinsic and intrinsic asthma and emphasizes that most patients can fall in either category. He proposes a classification based on the age of the patient, phase of the disease (whether acute, recurrent, or chronic), responsible factors, and complications. From a clinical viewpoint this is most valuable.

The book consists of 10 chapters followed by a bibliography and index. Individual chapters are devoted to the management of infection, bronchial evacuation, therapeutic use of gases, epinephrine, sedatives, and supportive therapy. The importance of the immediate nonspecific treatment during the acute attack is emphasized with little discussion of long-term allergic management. The author points out the danger of giving morphine in severe bronchial asthma and describes the death of 3 of his patients following the use of this drug. He recommends use of demerol hydrochloride in place of morphine; the reviewer believes that demerol also has little place in treatment of asthma because of the possibility of addiction when used in any chronic or recurrent condition. Chloral hydrate and sodium bromide as recommended for sedation by the author are most effective.

In the management of status asthmaticus the author emphasizes that intake and output should be measured and recorded in all these patients. Clinicians will recognize the excellence of this advice and its aid in treatment. Of interest was the author's opinion that self-medication with epinephrine should be avoided because patients with asthma tend to become dependent on this drug. This monograph includes a comprehensive discussion of all phases of the treatment of asthma and will prove of great value to general practitioners and specialists alike—Col W H Diersner, MC, U S A.

**MEDICAL GYNECOLOGY**, by James C. Janney, M D, F A C S, *Associate Professor of Gynecology, Boston University School of Medicine; Associate Visiting Gynecologist, Massachusetts Memorial Hospitals.* 2d edition. 454 pages, illustrated. W B Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$6.50.

This is a book for the general practitioner and describes office diagnosis and treatment in gynecology. Only operative procedures simply enough to be performed in the office are discussed. The author stresses the patient's complaints and the importance of the gynecologic history in diagnosis; discusses examination

tion of the patient, including the difficulties to be met and overcome gives his procedures in differential diagnosis and treatment. He also includes a section on sociomedical care for which the gynecologist and the general practitioner are often consulted. In this section Dr. Janney shares his long experience in the care of such problems as premarital care, marital maladjustment, sterility, and fertility.—*Commander M. A. Godinez, MC, U. S. N. and Lt (jg) R. L. Stout, MC, U. S. N. R.*

**LIPIDOSES, Diseases of the Cellular Lipid Metabolism**, by Siegfried J. Thannhauser, M. D., Ph. D., *Associate Professor of Medicine, Tufts College Medical School; Associate Physician-in-Chief, Joseph H. Pratt Diagnostic Hospital, Boston, Mass.*, edited by Henry A. Christian, A. M., M. D., LL. D., Sc. D. (Hon.), M. A. C. P., Hon. F. R. C. P. (Can.), D. S. M. (A. M. A.), *Hercy Professor of the Theory and Practice of Physic, Emeritus, Harvard University; Sometime Clinical Professor of Medicine, Tufts Medical School; Sometime Physician-in-Chief, Carney Hospital; Sometime Visiting Physician, Beth Israel Hospital; Physician-in-Chief, Emeritus, Peter Bent Brigham Hospital, Boston, Mass.* (Reprinted from Oxford Loose-Leaf Medicine with the same page numbers as in that work.) 605 pages; illustrated. Oxford University Press, New York, N. Y., publishers, 1950. Price \$12.

This book represents an excellent detailed summary of lipid and allied metabolic disorders. Supporting this is a good discussion of both diagnostic and laboratory procedures as each pertain to the recognizable lipidoses and pathologic syndromes, plus a chapter on the physiology and chemistry of fat. The previously established clinical syndromes in this field are used as divisions for discussion but in several instances (essential xanthomatosis) further differentiation has been offered (xanthomatous biliary cirrhosis). More recent ideas on the enzymatic disintegration of fats and the interrelationships with protein and carbohydrate metabolism are well discussed. This book is a valuable contribution to the library of internists, clinical physiologists, and pathologists who may from time to time have occasion for reference to an authoritative work on lipidoses.—*Lt Col. F. L. Bauer, MC, U. S. A.*

**GUIDING LEARNING EXPERIENCE, Principles of Progressive Education Applied to Nursing Education**, by Maude B. Muse, R. N., A. M., *formerly, Associate Professor of Nursing Education, Teachers College, Columbia University.* 617 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$4.50.

This book is written primarily for the experienced and the prospective nurse educator. The author, who has written other books on this subject, is a recognized authority. After many years of teaching and nursing, and continued study of educational theories, she became a professor in nursing. She encourages the nurse educator to adopt modern methods of teaching.

The book is divided into four parts. The first discusses and compares three educational philosophies: The traditional, the free school, and modern progressive education. The advantages and benefits derived from the progressive system in general and professional education are enumerated. The second part explains the nature and source of the principles of education and the purpose and role they play in learning. The chapters in this unit are devoted chiefly to the teaching-learning principles. They familiarize the teacher who seeks the goals of progressive education with the learning processes and other interrelated factors which constitute a sound teaching program for the learner. The third part applies these principles to clinical instructions. The last part discusses the



various methods used in planning a teaching program. The suggested activities at the end of each chapter are especially helpful in organizing a teaching program—*Lt M J Topercer, NC, U S. N.*

**ANTIBIOTICS, A Survey of Penicillin, Streptomycin and Other Antimicrobial Substances from Fungi, Actinomycetes, Bacteria, and Plants,** by H S Florey, M A, M B, Ph D, F R S, E Chinn M A, Ph D, F R S, N G Heatley, M A, Ph D, M A Jennings M A, B M; A G Sanders, M A, M B, Ph D, E P Abraham, M A, Ph D and M E Florey M B, B S. In two volumes. 1774 pages illustrated. Oxford University Press, New York, N Y., publishers, 1949. Price \$29.75 (not sold separately).

This set of books is a virtual encyclopedia on penicillin and streptomycin. Volume I is devoted entirely to those considerations applicable to all antibiotics, i. e., methods of detection, isolation, identification, assay, and methods of purification. This volume also contains an exhaustive history of antibiotics. It is of interest that the first reference to the use of specific micro-organisms to combat other micro-organisms was published in 1872. Yet in December 1940 *Waksman and Dubos were unsuccessful in an attempt to hold a round table discussion on 'the production of antibacterial substances by micro-organisms'* because not enough scientists were interested.

Volume II is devoted almost exclusively to penicillin and streptomycin. The first few chapters give detailed information on the known sources of penicillin, its production, chemical and physical properties, and synthesis. Following this are several chapters dealing with the susceptibility of micro-organisms to penicillin, their acquired resistance, the production of penicillinase, and the mode of action of penicillin on micro-organisms. This section closes with several chapters on the pharmacology of penicillin. Streptomycin and dihydrostreptomycin are handled in much the same fashion as penicillin except in somewhat less detail.

A comprehensive appendix contains information on the more recently discovered antibiotics as well as new knowledge of the older ones. At the end of this appendix a table lists most of the known antibiotics along with their important properties. This set of books is extremely valuable to the research workers and as a reference work in medical libraries. Its size, comprehensive detail, and cost will limit its value to the practicing physician—*Lt Col. R P Mason, MC U S A.*

**1949 YEAR BOOK OF ENDOCRINOLOGY, METABOLISM AND NUTRITION** (December 1949–January 1950). Endocrinology edited by Willard O Thompson, M D, *Clinical Professor of Medicine, University of Illinois College of Medicine, Attending Physician (Senior Staff), Henrotin Hospital, Attending Physician, Grant Hospital of Chicago*. Metabolism and Nutrition edited by Tom D Spies, M D, *Chairman, Department of Nutrition and Metabolism, Northwestern University School of Medicine, Director, Nutrition Clinic, Hillman Hospital, Birmingham, Ala.* 545 pages, illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$4.75.

This is an excellent reference for the busy physician who wants to keep abreast of the recent advances in clinical endocrinology, diseases of metabolism, and nutritional therapy. The book is in two sections. The first section devoted to endocrinology is edited by Dr. Thompson. Particular emphasis is put on adrenocorticotrophic hormones and 17 hydroxy-11-dehydrocorticosterone (compound E or cortisone). The second section, devoted to metabolism and nutrition and

thema, 60; anxiety neurosis, 10; hysteria, 5). The diagnosis of a benign nervous state was made in 321 cases. In 104 of these the term applied was chronic nervous exhaustion. The term nervous fatigue was used to describe the same condition when shorter in duration and less severe in degree. This diagnosis was made in 71, making a total of 175 cases of nervous exhaustion or fatigue, which in the service was called combat or operational fatigue. The diagnosis of simple anxiety was made in 73, nervous instability in 39, psychogenic gastrointestinal disorders, including irritable colon and nervous indigestion in 12, neuromuscular asthenia in 10, tension headache in 11, and neurodermatitis in 1.

#### SERIOUS MENTAL DEPRESSION

Reactive depression is a common problem in general practice. It was the diagnosis in 5 of the 1,000 patients seen. The common manifestations are low spirits, weeping, insomnia, self-reproach, feelings of guilt, slowing of the patient's normal action, inability to make decisions, and, sometimes, morbid ideas regarding disease and symptoms. These individuals frequently express a fear of losing their minds, and are potentially suicidal.

When threatened suicide is evident, the physician must decide without delay whether the patient is potentially suicidal or not, and if so, must be able to take appropriate action. Most bona fide suicidal attempts and successful suicides occur either in the course of a severe depression or in catatonic excitement (3). In the latter condition, suicide is likely to be a sudden, impulsive affair and attacks on others may occur as well. A sufficiently depressed person kills himself with deliberate and considered purposefulness. Such a decision may be carried out so rapidly that no opportunity for prevention may appear. More commonly the patient broods over the matter of self-destruction for a considerable period of time and may or may not apprise others of what is in his mind. It is not true that one who talks suicide never does anything about it. A serious suicidal intent may be strongly suspected when the patient is obviously sad and depressed but not too retarded in action, does not cry, expresses unshakable hopelessness, or speaks of suicidal ideas more or less matter of factly without seeming to be dramatic or to overdo it. Suicidal threats made in a dramatic manner are apt to be attention-getting gestures of a hysterical personality and while these people often make actual attempts at suicide, they are careful not to complete them. A patient extremely depressed and retarded may have insufficient drive to carry out self-destruction so that suicide is most likely to occur if a patient is going into or coming out of a deep depression. Thus, when

edited by Dr. Spies, is a concise résumé of the diseases of metabolism and their treatment. Pancreatic and liver function are discussed in detail. The physician may use the book as a ready reference, but with more leisure, he will want to read it all. A valuable feature is the Year Book Quiz of 20 questions that appears on the cover.—*Commander J. B. Burger, MC, U S N*

**A TEXTBOOK OF DENTAL ANATOMY AND PHYSIOLOGY** by Russell C. Wheeler, D. D. S., F. A. C. D., *Associate Professor of Anatomy at Washington University School of Dentistry, Saint Louis*. 2d edition. 422 pages, illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$6.75.

This is the second edition of a textbook on the fundamental forms, alignment and occlusion of human teeth. The material covered serves as a background for all phases of dental practice. The 16 chapters comprising this text include the gross anatomy of the individual teeth, their anatomy on cross section, their occlusion during various jaw relations, and the significance of the foregoing during function. The illustrations are excellent. This book is recommended as a text for dental students.—*Capt. W. J. Maras, U S (FR) (DC)*

**MODERN PRACTICE IN DERMATOLOGY**, edited by G. B. Mitchell-Heggs, O. B. E., M. D., F. R. C. P., *Physician-in-Charge, Skin Department, St. Mary's Hospital and Medical School, London; Physician, St. John's Hospital for Diseases of the Skin and Institute of Dermatology, University of London, Member Advisory Panel on Dermatitis, Ministry of Labour and National Service*. 836 pages; illustrated. Paul B. Hoeber, Inc., New York, N. Y., publisher, 1950. Price \$12.50.

This most recent compilation of correlated monographs by British dermatologists contains fresh and timely material presented in an arresting fashion. It is offered to senior students of dermatology and general practitioners. The fully qualified dermatologist can also find much of interest and value in this symposium. The editor and his 40 contributors in 50 chapters treat the subject of dermatology not only along the conventional lines of morphology and systems, but discuss the topographic, climatic, and social aspects as well. Such duplication as has resulted from these different approaches is advantageous from the standpoint of teaching. Of special interest are sections on psychosomatic aspects, the role of insects and parasites, the relationship to internal medicine, rehabilitation, technique of biopsy, and social aspects. The timeliness of the book is demonstrated by the inclusion of radiation blast injuries. Although little space is devoted to syphilis the subject is adequately covered. The illustrations are admirable and the subjects of the color plates well chosen. Unlike many British texts this volume is readily adaptable to the conditions of American dermatology.—*Capt. R. L. Gilman, MC, U S N.*

**PRINCIPLES AND PRACTICE OF PLASTIC SURGERY**, by Arthur Joseph Barsky, M. D., D. D. S., *Attending Plastic Surgeon, Beth Israel Hospital, New York City; Attending Plastic Surgeon, Morrisania City Hospital, New York City; Attending Plastic Surgeon, Bronx Hospital, New York; Attending Plastic Surgeon, Beth-El Hospital, Brooklyn, N. Y.; Attending Plastic Surgeon, New York State Rehabilitation Hospital, West Haverstraw, N. Y.; Clinical Professor of Surgery and Associate Surgeon, New York Polytechnic Medical School and Hospital; American Board of Plastic Surgery; American Society of Plastic and Reconstructive Surgery; American Association of Military Surgeons; Associate Member of British Association of Plastic Surgeons; Associate Member of Mexican Association of Plastic Surgery,*

formerly Lieutenant Colonel, M. C., A. U. S. 491 pages, illustrated. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$10.

The first six chapters of this book outline the fundamentals of plastic surgery. The final chapters deal with the practice of plastic surgery, especially emphasizing the author's own technique. An alternate plan as suggested by other plastic surgeons is also presented in most cases. The book is well written and well illustrated. The author has presented broad subjects concisely, thereby tending to oversimplification. Variations are not so well covered. An interesting chapter presenting the author's plan of excision repair, and x-ray and radiation treatment of keloids and hyperplastic scars is included. Very little material is presented however to show the postoperative course and results in these cases. The chapter on prostheses describes various ways of preparing casts and masks which would be of special interest to any one primarily interested in oral surgery and restorative prostheses.—Lt. Comdr J. T. Giannini, MC, U. S. N.

MARRIAGE IS WHAT YOU MAKE IT by Paul Popenoe, Sc. D., General Director The American Institute of Family Relations, Los Angeles, Calif. 221 pages. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$4.

Dr. Popenoe points out in this compact volume that most of the failures in marriage are unnecessary and could have been prevented by proper education before marriage. He demonstrates convincingly and interestingly, by many brief case studies, how competent marriage counseling can be an effective means of helping a person to understand his marital problems by giving him a mature insight into his own personality structure as well as that of his partner. The author's technique is based on sound and accepted psychological principles. He discusses practical methods of helping people whose marriage is threatened from every conceivable direction, such as by jealousy, nagging, so-called sexual incompatibility, quarrels over in-laws, the arrival of children and all the usual causes of tension in any family. Although this book would be of great value to any lay reader interested in insuring a happy marriage for himself, it is also an invaluable contribution to the libraries of psychiatrists, psychologists, and social workers who engage in the practice of marriage counseling.—Lt. Col. F. R. Drake, MC, U. S. A.

THE CEREBRAL CORTEX OF MAN. A Clinical Study of Localization of Function by Wilder Penfield, C. M. G., M. D. (Johns Hopkins), B. Sc. and D. Sc. (Oxon.), Hon. F. R. C. S. (Lond.), F. R. S., Professor of Neurology and Neurosurgery, McGill University, Director, Montreal Neurological Institute, and Theodore Rasmussen, M. D., Professor of Neurological Surgery, The University of Chicago, formerly Lecturer in Neurosurgery, McGill University, Assistant Surgeon, Montreal Neurological Institute, 248 pages, illustrated. The Macmillan Co., New York, N. Y., publishers, 1950. Price \$6.50.

This excellent study reports the results of cortical stimulation of over 500 craniotomized patients under local anesthesia. It contributes significantly to our understanding of cortical function. There is an excellent historic discussion of the subject. The data and conclusions are presented clearly. The book should be read by all neurologists, neurosurgeons, and psychiatrists.—Lt. Col. S. B. Ranson, MC, U. S. A.

HANDBOOK OF PHYSICAL MEDICINE AND REHABILITATION, Selections Authorized for Publication by the Council on Physical Medicine and Rehabilitation, American Medical Association. 573 pages; illustrated. Published for

the American Medical Association by The Blakiston Co., Philadelphia, Pa., 1950. Price \$4.25

This well-known handbook appears as a first edition at this time because of a change in title and the inclusion of "Rehabilitation" not included in the previous editions, the first of which appeared in 1932 as "The Handbook of Physical Therapy" and later editions appeared as "The Handbook of Physical Medicine." The addition of "Rehabilitation" broadens the scope of this edition to include all the medical, psychologic, and social services whereby a person recovering from disease or disability is taught to live and work. This required the marshaling of physical medicine, psychosocial adjustment, and vocational training to achieve maximal function of the individual and to prepare him completely for the fullest possible life compatible with his abilities and disabilities. The book is composed of a series of monographs on special subjects, some revised and rewritten and some, such as those on the physiologic effects of heat, the physiologic aspects of therapeutic exercise, the basic principles of therapeutic exercise, problems in hearing, physical medicine in ophthalmology, occupational therapy, and rehabilitation, entirely new. The new chapter on physical medicine in psychiatric practice is especially appropriate and adds to the value of this book. An effort is made to separate the useful from the useless among existing devices and procedures as well as to bring about a closer union between general medicine and surgery on the one hand and physical medicine and rehabilitation on the other. The book is attractive in appearance, logical in arrangement, and has an excellent index. An appendix presents a complete list of motion-picture films and lantern slides on physical medicine and rehabilitation.—*Lt. Col. J. H. Kuitert, MC, U. S. A.*

**LIGHT THERAPY**, by Richard Kovacs, M. D., *Professor of Physical Medicine, New York Polyclinic Medical School and Hospital*. Publication Number 57, American Lecture Series. 112 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

This interesting monograph covers in lucid detail the story and present status of light therapy. It briefly outlines the advantages of radiant energy in the various phases of the medical spectrum, indications for clinical use are clearly outlined, and physiologic effects to be anticipated are tabulated. Contraindications and dangers of the various forms of treatment are mentioned. A short chapter on the physics of radiant energy gives a clear and concise understanding of light therapy fundamentals. This handbook is highly recommended to the busy practitioner who uses any form of light therapy. It also will be found valuable in the training of medical students, interns, nurses, and physical therapy students.—*Lt. Col. R. J. Healy, Jr., MC, U. S. A.*

**GENITO-URINARY SURGERY**, by Sir John Thomson-Walker, D. L., M. B., C. M. Ed., F. R. C. S. Eng., *Consulting Urologist and Emeritus Lecturer on Urology, King's College Hospital, Consulting Surgeon, St. Peter's Hospital; President V Congress of Societe Internationale d'Urologie; Hunterian Professor Royal College of Surgeons 1907, Lathamian Lecturer, 1930, President Medical Society of London, 1933*. Edited and revised by Kenneth Walker, M. A., M. B., B. C. (Camb.), F. R. C. S. Eng., T. U. C. S., *Jacksonian Professor and Hunterian Professor, Royal College of Surgeons, 1911, 1922, 1924, 1933; Emeritus Surgeon to the Genito-Urinary Department, Royal Northern Hospital; Urologist, Hornsey Central and Dartford County Hospitals; Member of La Societe Internationale d'Urologie, Fellow of International College of Surgeons*, 3d edition. 356 pages, with 25 color

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and 73 black-and-white plates, and 282 illustrations in the text. Paul B. Hoeber Inc. New York N. Y., publisher, 1950. Price \$15.

This book of English publication is a thorough and complete treatise on genitourinary surgery. With the exception of the antibiotics that have been developed subsequent to penicillin it is entirely up to date. The sections, including excellent illustrations on surgical anatomy and technique are of particular excellence and make this book a valuable addition to the urologist's library. Because of its highly technical nature, however, it is not deemed suitable as a textbook for use in the training of medical students and physicians not specializing in urology.—Commander U. S. Curtis M. D. S. N.

WORLD SURGERY 1950 by Stephen A. Ziemann, M. A., M. D., F. A. C. S., F. I. C. S., Abstract and News Editor, *Journal of the International College of Surgeons, Abstracts and Abstracts*; formerly Assistant Chief, Bureau of Publications, Bureau of Medicine and Surgery, U. S. Navy and Assistant Editor, U. S. Naval Medical Bulletin 177 pages, 73 illustrations J. B. Lippincott Co. Philadelphia Pa. publishers, 1950. Price \$6.

This selection of abstracts from the world's surgical literature is exceptionally readable. The list of contents is so arranged that almost any abstract can be located at a glance without consulting the more complete subject index in the back. Reader interest is further enhanced by the quality of the paper, type, and spacing used. Although it would appear impossible to abstract the many journals and publishers that flood the surgical literature today in a single volume of 177 pages, as the individual abstracts are read the reader begins to realize that the author has picked out articles that are interesting as well as practical. The choice of articles abstracted is well-balanced and includes articles and more universal problems. Dr. Ziemann does not comment on the articles abstracted but his manner of writing imparts a definite feeling of confidence in certain of the articles while in others the reader is left to consider several different approaches to the problem involved.

The book is divided into 10 sections: gastrointestinal surgery, cardiovascular, neurosurgery and psychosurgery, obstetrics, orthopedics, genitourinary surgery, the head and neck, and a miscellaneous section dealing with anesthesiology, radiology, preoperative and postoperative care and antibiotics. General interest, abundance of material and new techniques have been used as a guide in allotting space to the various sections of the book. The sections on gastrointestinal surgery and cardiovascular-respiratory surgery are especially complete. Although certain chapters, such as those on neurosurgery and psychosurgery, and ophthalmology and otolaryngology may be of little interest to many general surgeons, they provide a pleasant and easy way of forming a speaking acquaintance with the newer trends in these specialties.

The references cited seem reasonably complete and they are conveniently located at the end of each abstract. In compiling the book, Dr. Ziemann has made good use of his known ability as an abstractor, linguist, author, and practical surgeon. To quote from the foreword by Dr. Max Thorek "World Surgery, 1950, meets a need not filled by the conventional textbook, the historical essay, or the specialized manual of surgical technique. Yet it contains elements that appear in them all, plus a certain literary perspective and sense of proportion that lifts it beyond the usual in its field.—Capt W. S. Laidler, M. C., U. S. N."



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#### COVER PHOTOGRAPH

Medical Services personnel cut blood-soaked clothing from wound of a South Korean Marine shot as United Nations' forces pushed along the road between Inchon and Seoul. Site is a roadside aid station near the front lines.



# UNITED STATES ARMED FORCES MEDICAL JOURNAL

*Published Monthly by the Armed Forces Medical Publication  
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Frederic W. FARRAR, *Captain, MC, U. S. N., Editor-in-Chief*  
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## Foreword

The UNITED STATES ARMED FORCES MEDICAL JOURNAL represents the unification of the BULLETIN OF THE UNITED STATES ARMY MEDICAL DEPARTMENT, published since 1922, and the UNITED STATES NAVAL MEDICAL BULLETIN, published since 1907. This joint periodical is the medium for disseminating information of administrative and professional interest to all medical personnel of the Department of Defense.

It is the aim to include in each issue administrative directives, original scientific and professional articles, editorial comments on current professional literature of special interest, clinical notes descriptions of new devices and instruments, abstracts of articles from various medical periodicals, and notices and reviews of newly published professional books of interest to all commissioned medical personnel of the Department of Defense.

The Director, Medical Services and the Surgeons General of the several services extend an invitation to all medical officers, dental officers, Medical Service Corps officers, Nurse Corps officers officers of the Veterinary Corps, all officers of the ancillary services of the medical services of the Armed Forces, and to the medical consultants of the Army, Navy, and Air Force to submit manuscripts for publication in this JOURNAL.

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a patient is recovering from a reactive depression with the help of shock treatment, this complication has to be watched for.

A general practitioner frequently first sees such patients when they complain of various somatic dysfunctions which we will discuss later. They complain of profound lack of energy and a feeling of being no longer able to cope with day-to-day activities. The practitioner's contribution to the handling of such cases is his early recognition of the suicidal potentiality and prompt psychiatric treatment.

### TOXIC PSYCHOSES

It would appear obvious that insomnia requires medication, but this is erroneous. While sedative and hypnotic drugs have an important place in the treatment, they should be closely supervised, as in psychotic or neurotic individuals these drugs may actually increase the symptoms. Only rarely is the administration of a hypnotic necessary for more than a few days at a time.

Insomnia should be differentiated from general sleeplessness in that the person with insomnia is unaware of the deeper causes of his affliction. Most persons who have difficulty going to sleep have unconscious death fantasies of long duration. The patient avoids going to sleep to keep himself from terrifying or disturbing dreams. The person very definitely is afraid to go to sleep. When he does go to sleep, the next day he refuses to admit that he dreams.

The symptoms and signs of intoxication by the bromides or barbiturates may appear insidiously and may be obscured by the patient's preexistent complaints and thus go unrecognized until a dangerous toxic state has been reached. This may be characterized by restlessness, confusion, disorientation, and sometimes hallucinations. A rash may appear. In all cases where a delirious reaction without obvious cause is seen, these drugs should be suspected. Not infrequently in a psychiatric practice we have patients referred who show a chronic confusional state with drowsiness and apathy, an acute delirium, or even a profound shocklike state with marked depression of the vital centers, which have all been caused by overdosage with barbiturates. On the other hand, it should be remembered that in those habituated to large doses of barbiturates, the sudden and complete withdrawal of the drug is inadvisable. Not only will distressing anxiety symptoms result but not infrequently convulsions may occur when the long-standing cortical depressant influence is suddenly removed.

In cases of delirium tremens, the treatment of the underlying alcoholism should await the clearing up of the toxic symptoms. It should not be forgotten that mental symptoms can be caused by the sulfa drugs or the lack of the vitamins. Also, a woman's underlying

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OFFICE OF THE SECRETARY OF DEFENSE  
WASHINGTON 25, D. C.

MEMO To Personnel of the Medical Services of the  
United States Armed Forces

The ideals embodied in the spirit of Christmas are a reminder of the goal of free people everywhere - the goal of peace, which has been a beacon light to struggling mankind for all these years.

This Christmas season will find many of us away from our homes serving wherever the country's needs dictate. Each of us faces certain problems and certain sacrifices in the job before us. Yet our efforts will seem a small contribution, indeed, if the reward is Peace on Earth, Good Will to Men.

A Merry Christmas and a Joyous New Year to every one of you.

*Richard L. Meiling*  
Richard L. Meiling, M.D.  
Director of Medical Services





manipulation. The success of such measures was one of the most important medical lessons of World War II.

Soldiers who became psychiatric casualties on the battlefield received what may be called psychiatric first aid from members of their own combat unit. If evacuated from their unit, they were first seen in medical channels at the *Battalion Aid Station* where simple, but for many patients definitive, therapy was undertaken. A high percentage of patients were returned from this level to full duty. Those who were evacuated received further evaluation and treatment at the *Division Clearing Station*, where treatment was under the direction of the division psychiatrist. From 20 to 40 percent of all psychiatric casualties were returned to full duty from this point. Patients requiring more prolonged care and treatment and who were not considered salvageable for combat duty in the division within the time limits established were evacuated to the *Army Neuropsychiatric Treatment Station*, operating on evacuation hospital level under control of the Army surgeon. The latter station also received overloads from the division psychiatric facilities at times when casualties exceeded their capabilities. The Army Neuropsychiatric Treatment Stations held and treated patients for usually not more than 5 days. No psychiatric patients were evacuated from Army without passing through one of these installations. From 10 to 20 percent of all patients were returned to full combat duty from this level.<sup>3</sup>

Treatment methods at the Division Clearing Station and at the Army Neuropsychiatric Treatment Station did not differ markedly. Both rendered definitive care to a high percentage of patients evacuated to them. In the discussion of treatment methods which follows, they are considered together.

#### TREATMENT WITHIN THE COMBAT UNIT

Unit personnel were the first to deal with the soldier with psychiatric complaints. The importance of their handling of the problem often went unrecognized, but was fully as great as that of surgical first aid. The most successful programs of forward area psychiatric treatment (e. g., in the 3d and 85th Infantry Divisions) placed much emphasis on indoctrination of company officers in proper methods of management of psychiatric complaints at this level. The division psychiatrist, 3d Infantry Division, outlined the principles to be followed to all infantry officers routinely at the time they first reported for duty in the division. A similar program was followed in the 85th Infantry Division.<sup>4</sup> In both of these divisions, indoctrination of

<sup>3</sup> Training Circular, No. 6-7 April 1950.

<sup>4</sup> GLASS, A. H. Psychiatry at the division level. Bull. U. S. Army M. Dept. (supp.) pp. 45-73, Nov. 1949.

company officers was continued during frequent visits of the division psychiatrist to individual units.

Proper first aid, either surgical or psychiatric, always entails an assessment of the severity of the patient's condition and a decision concerning the need for more definitive medical care. Consequently, company officers were instructed in the criteria to be followed in making such decisions in psychiatric problems, and were encouraged to develop confidence in their common-sense ability to "size up" patients with psychiatric complaints. It was a well-recognized principle of surgical first aid that soldiers with minor bruises or unimportant lacerations should not be evacuated. Rather, they were kept with their units and given what simple treatment was possible there. Similarly, it was held to be important that company officers not evacuate soldiers with relatively minor psychiatric problems. Such soldiers were much better handled by being given suitable superficial help within their own unit. Company officers encouraged wavering soldiers by exhortation and leadership, by counselling, reassuring, and by making alterations in job assignment in some cases. Thus soldiers with relatively minor complaints were prevented from entering medical channels where the dissolution of group ties, and the factors of secondary gain and suggestion would tend to fix their symptoms.

#### AT BATTALION AID STATION LEVEL

The psychiatric casualty first encountered formal medical treatment (as opposed to "first aid") if he was evacuated to the Battalion Aid Station. Although the battalion surgeon was not a psychiatrist, his management of psychiatric casualties was of a degree of importance difficult to overestimate. Although accurate statistical records were not maintained by battalion surgeons, it has been estimated that at least 60 percent of all psychiatric patients were treated and returned to full duty at this level.<sup>5</sup>

*A. Treatment of fatigue, exhaustion, and effects of exposure.*—The major portion of psychiatric patients admitted to Battalion Aid Stations consisted of soldiers with from mild to moderate anxiety states complicated by physical exhaustion and the effects of exposure. These men were usually wet, cold, dirty, and physically worn out. Any judgment based on the first short interview with them was highly fallible. Although a man might appear to be at the end of his rope one evening, after a good night's rest under sedation in dry clothes and blankets in the luxury of a hayloft, he was often ready and willing

<sup>5</sup> TAYLOR, C. C.: Psychiatric Treatment in the Battalion Aid Station. (Speech given at the Seventh Army Medical Conference, Nov. 1944.) Much of the content of this article which deals with the Battalion Aid Station draws heavily on a transcript of this speech.

to return to his company. Therefore, if at all feasible, borderline cases were kept in the vicinity of the aid station under medical management for 24 hours. The factor of adequate sedation of these acute cases cannot be overemphasized. Most were given from 0.36 to 0.55 grams of sodium amytal orally, or a corresponding dose of one of the other barbiturates. Every attempt was made to aid these soldiers in getting cleaned up, dry, and adequately fed.

It was usually found to be advisable to locate aid stations in buildings if possible because they provided more space for treatment and more apparent safety. It is advisable to say "apparent" because it

adequate shelter.

*B. Psychotherapy* at the Battalion Aid Station varied with the type of patient and was almost invariably, and of necessity, superficial. The attitude of the battalion surgeon was of prime importance in determining the outcome of the case. It was necessary that there be an air of calm confidence in all his decisions. Ideally, he was firm, yet understanding, so that all of his dispositions were regarded as final. His manner and all his remarks indicated that he expected an early return to duty of the soldier after he had rested. Medical discipline was maintained, and every effort was made to avoid allowing the aid station to become confused and crowded with men on doubtful status.

1. *Normal fear reactions.*—A large group of patients manifested symptoms that consisted essentially of no more than the somatic and psychologic manifestations of the normal combat fear reaction. These soldiers were treated by proper examination, evaluation, explanation, and reassurance. Although such management appears simple, mistakes were frequently made.\* These patients were usually sincere. Most frequently they were replacements, or men returning to duty with their organizations after hospitalization. As combat approached, palpitation, nausea, tremulousness, and other somatic manifestations of the usual fear reactions began to manifest themselves. The soldier became alarmed and interpreted these symptoms as those of cardiac, gastrointestinal, or other physical disorders and reported to his medical officer.

It was always important that these patients not be slighted. They were given an examination involving the appropriate organ system. If this was negative they were told so promptly and definitely. The cause of the symptoms was carefully explained to them, and they were

\* RAYSON, S. W. Normal battle reaction, its relation to pathologic battle reaction. *Bull. U. S. Army M. Dept. (Supp.)* pp. 3-11, Nov. 1949.

assured that there would be no lasting effects or disability. Sometimes it was of help to invite these men to inquire among their friends concerning their sensations. They were frequently surprised and pleased to find that they did not differ from the men who were carrying on without apparent concern. In any event, if it was possible to carry these men through the first few days of combat, they became acclimated and stopped coming to the aid station.

2. *Mild to moderate anxiety states*.—Patients with mild to moderate anxiety states with varying degrees of exhaustion and exposure, were treated chiefly by sedation and by measures designed to counteract fatigue and exposure, as outlined above. Psychotherapy, which was superficial, consisted of reassurance, support, and exhortation. After 24 hours many of these patients felt completely recovered or markedly improved and could be returned directly to duty. Others showed little, or insufficient improvement, and were evacuated for further definitive care by the division psychiatrist.

3. *Severe neurotic reactions and psychoses*.—Certain patients were obviously unsuited for management in the Battalion Aid Station. These exhibited disturbed anxiety states with severe agitation and tension; acute panic states; severe hysterical manifestations; and acute psychoses. Although evacuation was the only conceivable position for such patients, it was found to be a great mistake simply to pack them into an ambulance and ship them to the rear. It was important that they be adequately sedated to render their evacuation feasible and nontraumatic. The most important consideration was to protect the patient from further psychic trauma in transit. Tense, disturbed soldiers with battle incurred anxiety reactions had a greater than usual tolerance for barbiturates and a much lower than usual threshold for pathologic reactions to combat stimuli. The dose of sedative, therefore, depended on the severity of the patient's reaction and the expected degree of enemy action or other psychic trauma to be encountered along the route of evacuation. The drugs most commonly used were the barbiturates, either orally or (in rare instances) parenterally. The most commonly used drug was sodium amylal in dosages of from 0.36 to 0.55 grams. It was found to be important that sedation be given in sufficient time to reach maximum effect before evacuation was undertaken. Care was taken to avoid converting a walking into a litter case by oversedation. Morphine and other opiates were less satisfactory than the barbiturates and their use was considered to be contraindicated.

4. *Administrative problems*.—Two other types of patients should be mentioned. Their proper management was of great importance in preservation of group morale. The return of patients of these types to full duty was mandatory. The so-called "gold bricks" be-

longed to this group of cases. These consisted of the true, simple malingerer and the soldier with some minor organic or functional condition which he exaggerated. Toward these men the attitude of the surgeon was of necessity one of uncompromising firmness. After a careful medical evaluation, he let the soldier know that he considered the situation trivial, and that it did not merit consideration of relief from duty. This was usually sufficient, but if the soldier persisted in his attitude or refused to accept the situation, reference to the possible consequences of such action usually discouraged further attempts. Habitual stragglers constituted another class of administrative problems requiring management by the battalion surgeon. These were the oh-so-willing soldiers who just could not keep up, or who got lost or misunderstood orders, or produced any number of other excuses leading to their arrival at the aid station when an attack was just getting under way or was momentarily expected. These men were best managed by providing instructions and when possible, guides or transportation back to the company in time to make or receive the attack. In this way, they came to realize that the subterfuge did not "pay off" and entailed only additional trouble and risk.

(a) *Kitchen and service trains.*—In the earlier phases of World War II, acute psychiatric patients frequently were sent to unit kitchens or service trains for rest, after which it was expected that they would return to duty. Although this practice was common at first in the 34th and other divisions in North Africa and Italy, many men not only did not improve under such conditions, but actually reported themselves to be worse and a great deal more tense. Some divisions (especially the 36th and 85th) set up regimental rest centers under the supervision of the regimental surgeon or dental surgeon. Such centers were more successful because they maintained good medical care and discipline—the degree depending largely on the attitude, ability, and insight of the medical officer in charge. Any type of rest without proper administrative control and medical supervision tended to fix symptoms and render return to duty less probable.

In summary, treatment at the Battalion Aid Station involved: (a) maintenance of good medical discipline; (b) the exhibition of an attitude of sympathetic firmness which expected return to full duty of most patients; (c) provision of proper rest and other measures designed to relieve fatigue and the effects of exposure; (d) treatment of as many patients as possible on duty status; and (e) adequate sedation, when indicated, with special emphasis on proper sedation of all patients evacuated to the rear from the aid station.<sup>7</sup>

<sup>7</sup> As general source material on this subject the following article is recommended:  
SOMEL, R. Battalion surgeon as psychiatrist. *Bull. U. S. Army M. Dept.* (Supp.) PP 36-44, Nov. 1949.

# AT DIVISION CLEARING STATION AND ARMY NEUROPSYCHIATRIC TREATMENT STATION LEVEL

If evacuated from a Battalion Aid Station, psychiatric patients were received by the division psychiatrist at the Division Clearing Station. At this level, definitive treatment of a large proportion of such patients was undertaken. Those unsuitable for treatment here, and those who had not responded to treatment, were evacuated to the Army Neuropsychiatric Treatment Station. Not infrequently, however, an excessively heavy case load forced the division psychiatrist to evacuate all types of patients, regardless of their suitability for treatment at division level. The Army Station served as a back-stop to the division psychiatrist. Therapy at Division Clearing Station and Army Neuropsychiatric Station levels were therefore interchangeable in a sense. Facilities for treatment were more elaborate at the Army Station, and definitive therapy was carried out in a higher percent of patients than at the Division Clearing Station. Essentially, however, differences in therapy at the two levels at various times resulted chiefly from fluctuations in the military situation, which by overloading the facilities of the division psychiatrist made it necessary for him to evacuate incompletely treated cases to the Army Station. Because the principles of treatment were essentially the same in both places, discussion of treatment at the two levels will be considered in a single section.

*A. Treatment for fatigue and exposure.*—Although a large percent had previously received some treatment for fatigue and exposure at Battalion Aid Stations, many arrived in a state of fatigue; they were cold, dirty, hungry, and worn-out. For these, rest under sedation was promptly instituted. They were placed in adequately heated tents, sleeping on cots, under a sufficient number of blankets. Hot food in copious quantities was made available. Most of them were given barbiturates by mouth.

*B. Alliteration of deprivations.*—These men had usually been subjected to many deprivations, both physical and psychologic. At the Division Clearing Station and the Army Neuropsychiatric Treatment Station an attempt was made to alleviate these to the fullest possible extent. The soldier was given a change of clothing, was encouraged to avail himself of the opportunity to shave with hot water, and to use the hot showers which were usually available. Recreational equipment and facilities were provided. Movies were often shown; reading and writing materials were at hand; and the patient was provided with cigarettes, candy, and personal items. Red Cross counselling and aid were available to soldiers with personal or family problems of a welfare nature. A chaplain was present for those who had felt

the lack of adequate contact with sources of religious support during combat.

*C. Psychotherapy*.—1. *The patient-physician relationship, and the history-taking situation*.—It was found to be important that the psychiatrist combine with an attitude of respect and sympathy for the patient, the qualities of firmness, decisiveness, and realism. The aim was to allow no doubt to arise in the patient's mind that he would be expected to return to full duty when capable of doing so. The technic of history taking was very important, both in obtaining proper understanding of the case, and as therapy in itself. It was essential that the examiner hear the patient out, and that the patient feel that he had received a fair hearing. If physical complaints were present, the organ system involved was carefully examined. Above all, no matter what the pressure of the situation, the psychiatrist avoided giving the patient a "brush-off." On the other hand, leading questions were always avoided because these patients were highly suggestible.

2. *Ventilation*.—Hearing these patients out, and allowing them to ventilate their fears, hopes, and resentments often brought symptomatic relief. The amount of material ventilated was frequently extraordinary. While it was being produced the psychiatrist strove to remain passive. During the course of such "talking-out," it was occasionally possible for the patient to formulate and work through his problems with a minimal degree of direction by the psychiatrist.

3. *Support of super-ego*.—Loyalty, and sense of duty to his buddies were among the most important supports of the soldier in combat. Invocation and strengthening of these forces were found to be of value in helping the wavering soldier to endure. The psychiatrist did not hesitate in properly chosen cases to call on the soldier's loyalty to his buddies and immediate combat group, and to point out the implications of his duty to support and defend his family. Although many soldiers responded to this type of appeal, calls on the soldier's loyalty to larger groups—the nation or the Army—were relatively less effective.

4. *Suggestion*.—Avoidance of suggestion of illness was reflected in the organization and atmosphere of treatment stations, and in the attitudes and actions of the psychiatrists. As much care was adopted to avoid suggestion of serious psychiatric illness, as of physical illness. The appointments and atmosphere of a conventional hospital were avoided to the fullest possible extent and Army and division psychiatric treatment facilities were made as much like ordinary Army leave or rest centers as was consistent with their medical mission. Except during the coldest of winter months, most division and army psychiatric treatment facilities were installed in tents rather than buildings. Patients slept on folding canvas cots, rather than beds, and neither mattresses nor sheets were provided. Patients therefore

tension may be relieved by the administration of estrogen, but, in some cases, the tension is made worse.

### ACUTE ANXIETY

Acute anxiety states or panic reactions may be the response to a more or less sudden activation of an underlying emotional conflict by internal or external influences. Often anxiety states are the precursors of a severe psychosis of a schizophrenic type, such as a catatonic excitement. The patient may consult the physician because of the "jitters," palpitation, giddiness, headache, and may have difficulty telling the physician about his real fears of losing his mind, and possible concern about homosexuality. The busy physician may pass off the patient's complaints lightly and send him away with a prescription for phenobarbital and the admonition to "forget it." Unfortunately, the patient may be able to "forget it" only by becoming psychotic. If the patient is encouraged to talk about these hidden fears to a calm and sympathetic listener, a psychosis may be averted. The physician may reassure the patient about the unreality of his worries and point out the normality of his impulses. Such expenditure of time may spell the difference between sanity and insanity.

A recent report (4) stated, that of 6,000 industrial workers, 20 percent of their working time was lost in acute anxiety, and that during this period they caused more than 50 percent of all accidents. One-third of the workers studied had two-thirds of all the accidents. These figures indicate that the majority of accidents constitute a psychosomatic problem. Last year, accidents killed 100,000 persons and maimed about 400,000, with an estimated cost of \$5,000,000,000. Significant also is the fact that accidents, not disease, cause more child deaths than any other cause. Accident-proneness deserves closer attention as part of a distinct clinical syndrome. It has been estimated that about 80 percent of all accidents have their origin in personality disorders.

### UNDERSTANDING PERSONALITY

In the understanding of personality it is necessary to understand the early expression of tension. Unsatisfied hunger, fear, anger, insecurity, overstimulation of the bowel or urinary-genital area, and painful sensations may build up a tension in the individual, and require emotional release. These emotions are early, not always clearly differentiated, and find common pathways of expression in unorganized hyperactivity of the skeletal musculature. The various bodily systems, such as the respiratory, circulatory, gastrointestinal, genito-urinary systems, and the skin and mucous membranes may rig-



slept in no greater luxury than personnel in leave or rest centers. There were no nurses, and all necessary ward care was administered by enlisted male orderlies, wearing regular O. D. or fatigue uniforms, not the white hospital orderly uniform. Patients remained in regular uniform: pajamas and convalescent suits were not issued.

Patients remained ambulatory and were not waited on except in the uncommon instances in which physical disease or disturbed behavior clearly necessitated it. Patients served themselves in the "chow line" for all meals, and went without assistance to the latrine. They made their own beds and policed the ward around their beds. All patients assisted in the performance of light work about the hospital on request.

All possible steps were taken to foster the expectation of return to full combat duty after a brief rest. Application of this principle was most highly developed at those division psychiatric treatment facilities which were organized as Treatment and Rehabilitation Centers. These were nonmedical installations, unprotected by the Geneva Convention. Their chief function, aside from treatment of psychiatric battle casualties, was to give physical training and battle indoctrination to replacements and soldiers returning to duty at the front from hospitals.

Both division and army psychiatric treatment facilities moved their entire patient load with them during all forward moves, whenever this was practicable. This avoided unnecessary transfer of patients to rearward installations, and fostered in the minds of patients the impression that they were probable candidates for return to full duty.

The psychiatrist in his contact with the patient avoided suggestion of organic or psychiatric illness. He maintained an attitude of firm kindness, and avoided display of oversympathy and concern. In the opening phases of his examination, he generally concentrated on a realistic appraisal of the combat situation and the stresses to which the patient had been subject, rather than on the issue of illness. By patiently allowing the soldier to express himself without prompting, and by phrasing all questions in neutral terms, the examiner obtained a full and complete story of the present illness, uncomplicated by symptoms suggested by leading questions.

The psychiatrist also avoided unnecessary suggestion of illness by making organic diagnoses and rendering medical treatment as indicated, decisively. He avoided subjecting the patient to unnecessary referrals to others for special examinations, consultations, laboratory and x-ray work, and abstained from "passing the buck" by needlessly evacuating patients to rearward medical installations for diagnosis and treatment. It was repeatedly demonstrated that indecision, unnecessary referrals, unnecessary evacuations for "specialist opinion,"

and unnecessary special diagnostic procedures, firmly implanted the idea of illness in patients through suggestion, and by enhancing the secondary gain of illness. For the same reason, unnecessarily long stays in hospital were avoided, because to the patient they suggested continued and perhaps undiagnosed illness.

Not only was suggestion of illness avoided, but the positive suggestion was implanted that the patient was not seriously ill, that his symptoms would be alleviated, and that he would return to full combat duty. In the proper type of case, suggestion was used in an individual manner as a sharply directed tool, to eliminate specific hysterical symptoms. Direct suggestion was occasionally made, often accompanied by "laying on of hands" that a paraplegia would disappear, that a tic would cease, or that blindness would be replaced by normal vision. The symptom frequently vanished in a dramatic manner. Treatment confined to such suggestion did not significantly alter basic psychopathology. The symptom removed by pure suggestion often recurred, or was replaced after a short while by another hysterical symptom; or on removal of the symptom the patient might be flooded with anxiety.

Therefore, while direct suggestion was frequently employed in treatment of hysterical symptoms, it was usually combined with uncovering of amnesic material and abreaction, and manipulation of secondary gain. When properly combined with one or both of these tools, direct suggestion was therapeutically valuable. In general, any uncovering therapy that was not supplemented by positive direct suggestion, did not attain its full therapeutic possibilities.

5 *Uncovering therapy* in forward area military psychiatry was directed chiefly toward the recovery of repressed traumatic battlefield experiences. Such material was occasionally recovered in the course of ordinary therapeutic interviews as the result of firm suggestion by the psychiatrist that the patient would now be able to recall his forgotten experiences. In the event of such recovery of repressed material, there was frequently much simultaneous release of emotion (abreaction).

(a) *Uncovering therapy with intravenous barbiturates.*—In general, nonmanipulative uncovering techniques were too time-consuming to be feasible in the forward area situation, and reliance was placed chiefly on uncovering techniques using intravenous barbiturates ("narcosynthesis," "narcoanalysis") or hypnosis. In the European and Mediterranean Theaters, the techniques employed generally included the use of some type of narcosis (pentothal sodium, sodium amytal, or ether). In the Pacific Theater, particularly during the Okinawa campaign,

hypnosis induced without preliminary narcosis was considered the method of choice.<sup>8,9</sup>

The most commonly used technic in the Mediterranean and European Theaters employed preliminary injection of pentothal sodium. It was popularized by Grinker and Spiegel<sup>10</sup> as a result of their experiences in the Tunisian campaign, but had been extensively used and described before by others.<sup>11</sup> The technic varied somewhat from examiner to examiner. That which will be described here was developed and standardized in the Fifth and Seventh Army Psychiatric Centers.<sup>12</sup>

Whenever possible, a special tent or room was set up for the purpose. It was kept partially darkened and quiet during the treatment. Before treatment was begun, it was explained to the patient, and he was encouraged to expect improvement of his symptoms as the result of it. He was led to expect that in the course of the treatment he would imagine himself to be on the battlefield again, and that he would relive the forgotten experiences.

One-half gram of pentothal sodium, dissolved in 10 cc. of distilled water, was injected over the course of 4 or 5 minutes while the patient counted backwards from 100. Injection was terminated when counting became thoroughly confused or stopped. Recognizing the proper endpoint was a matter of experience. In general, between 0.15 and 0.4 gm. was injected. At the end of injection, the therapist strongly suggested that the patient was back on the battlefield at that point in time which the history had shown to represent the probable beginning of the amnesic episode. It was usually of value at the same time to simulate battlefield noises, such as the whistling of a shell, and to call out to the patient to take cover. At the 312th Station Hospital in France, special noisemaking apparatus was used for this purpose, but at most other installations such apparatus was considered neither necessary nor desirable.

In most cases, the patient now began to cower, exhibit startle reactions, and show other evidences of battlefield terror. He called out to others as if in combat and proceeded to re-enact the traumatic experiences. At the points of greatest trauma, the emotions of fear, rage, and grief were usually forcibly expressed, and tears appeared.

<sup>8</sup> MARKLY, O. B. Report on psychiatric service during Okinawa campaign. Submitted to Surgeon, Tenth Army 1 July 1945

<sup>9</sup> KAPFMAN, M. R. Report of neuropsychiatric observer in Okinawa operation. Submitted to the Surgeon, Pacific Ocean Area 16 May 1945

<sup>10</sup> GRINKER, R. R. and SPIEGEL, J. P. War Neuroses in North Africa. The Josiah Macy, Jr. Foundation, New York N. Y., 1943

<sup>11</sup> WILDER, J. P. Narcoanalysis in treatment of war neuroses. Brit. M. J. 2: 4-7. July 4, 1942

<sup>12</sup> This technic was portrayed graphically in a sound movie U. S. Army Film FB 184, Psychiatric Procedures in the Combat Area.

Ordinarily it was expedient for the therapist to remain passive at this point, allowing the patient to proceed serially through his battle experiences, without being hurried or prompted. During the reenactment it was occasionally wise for the therapist to assume the conversational role of one of the patient's "buddies," or his sergeant, lieutenant, or battalion surgeon, or of several of these successively. It was necessary to be certain that the entire series of repressed traumatic events was covered systematically before the session was terminated. If, after the patient had been allowed to produce spontaneously for some time, amnesic gaps still remained, the therapist prompted their filling by the appropriate questions and stimuli. In order that the interview not be prematurely terminated after the narcotic effects of pentothal had worn off, the therapist occasionally introduced hypnotic suggestions and commands. By doing this, he was able to prolong the interview indefinitely at his discretion.

When all amnesic material had been recaptured, the patient was prepared for termination of the procedure by being told he was in a hospital, that he had remembered the forgotten events, and that he would recall them on awakening. He was assured that his symptoms would be improved. If his disposition to noncombat duty had been already determined, he was reassured regarding this. The patient was then awakened. Reassurance was repeated, and the recaptured amnesic material was reviewed. Although many patients resisted this repetition, it was found to be extremely important. If not gone through with, the material was frequently repressed again, insight lost, and symptomatology resumed partially or completely. The disappearance of such symptoms as tics and pareses was pointed out to the patient, and he was assured that they had disappeared permanently.

If all points were systematically covered in the original session, optimal results were usually obtained in one pentothal session, and no further sessions were required. In a small percent of patients, recapture of repressed material was not complete, or there were residual symptoms, and one or two further sessions were necessary. Relief of symptoms was usually striking. Not only were hysterical symptoms such as tics and pareses removed, but probably the most striking result was seen in relief of tension, anxiety, and retardation, and in restoration of self-confidence. After a successful session, the patient gave the impression of being a healthy rather than a sick person.

Certain other types of response were less frequently encountered:

- (1) In the most common variant, the patient's productions were entirely in the past tense. Often, but not always, this was accom-

panied by considerable emotion, and by appropriate gestures such as the avoidance of shells. A fair portion of such interviews were successful in recovering the amnesic material, and the therapeutic results were often satisfactory. If they were not, a second session on a subsequent day often produced a more successful dramatic reenactment, in the present tense.

(2) In another variant response, the entire session differed little from any other psychiatric interview. Little emotion was aroused, the story was recited in the past tense, and the amnesic material was usually not recovered. The patient addressed the physician as such during the interview, the typical subsequent amnesia for the session was lacking, and the therapeutic result was usually unsatisfactory.

(3) Occasionally all that was elicited was a silly, drunken response. Being of no therapeutic value, such sessions were rapidly terminated.

(4) The malingerer typically responded with negativism, refusing to cooperate, answer questions, or tell his story. Occasionally, he became echolalic. Fantastic responses and obvious volitional productions for the purpose of misleading the therapist were occasionally seen.

Uncovering therapy using pentothal was indicated in any battle-precipitated psychiatric disorder in which a period of amnesia existed for presumably traumatic battlefield events. It was indicated in nearly all battle-precipitated hysterias, with or without complete binding of anxiety. Results were almost certain to be satisfactory in patients with paralyses, pareses, tics, gross tremors, and hemi-tremors.

In many extremely tense, retarded patients with anxiety states, a period of amnesia for battlefield events could be demonstrated, and in these the procedure was definitely indicated. Perhaps some of the most gratifying therapeutic results were obtained in these patients. The procedure was of little value when amnesic gaps were not present. When, however, instead of a definite amnesic gap, there was hazy or fragmentary recollection of a certain period on the battlefield, the therapeutic results were often quite satisfactory. Intravenous injection of pentothal was often of value in patients with an entirely mute panic state. In such patients, no narcoanalysis was performed; no attempt was made to recover amnesic material or precipitate a reenactment. Instead, as the pentothal induced relaxation, ordinary conversational contact was established with the patient. This was usually successful in eliminating mutism.

Pentothal uncovering therapy was contraindicated in the severe anxiety states with panic and confusion (the pseudopsychotics). Such patients were "stuck" in their traumatic battlefield experiences,

and were in fact reenacting fragments of these experiences. With these patients, the first task of therapy was to re-establish contact and orientation. This was hindered by the administration of any sedative. In simple anxiety states of from mild to moderate degree pentothal interviews were not only unilluminating, but actually decreased tolerance to further battle stress.

(b) *Uncovering therapy using hypnosis*.—Uncovering techniques in which the suggestible state was induced by hypnosis rather than by intravenous sedatives, were primarily used in the Pacific, particularly in the Okinawa campaign. Subsequent to induction of the dissociated state, the procedure differed little from that described for the pentothal interview.

(c) *Critique of manipulative uncovering methods*.—Existing explanations of the mechanisms of narcoanalysis did not fully satisfy many combat psychiatrists. There was little doubt that recovery and reintegration into consciousness of repressed traumatic memories, and the abreaction attendant thereon, were of fundamental importance, but the influence of several other factors remained unevaluated—the influence of suggestion, and the impact of this dramatic procedure on the patient-physician relationship. The role of the intravenous sedative was not clearly defined. Much fundamental research was suggested by these questions, but was never undertaken.

6. *Reassurance*.—Because psychiatric patients in the combat area were easily convinced that they were seriously ill, either physically or psychiatrically, it was found to be extremely important that the physician reassure them decisively after proper physical examination, that they had no serious physical illness. Similarly, it was found to be important that the patient be reassured concerning the magnitude of his psychiatric disability. In appropriate cases it was stressed that the reaction was situational, that it would be short-lived, and that it had no relationship to insanity. The patient was told that there should be no permanent aftereffects, and that the reaction should have no effect on civilian adjustment, on ability to work effectively, or to make proper social and marital adjustments. In patients returning to full combat duty, it was found to be wise to reassure the patient that an episode of emotional decompensation was not necessarily incapacitating for further effective combat duty. In general, events and reactions were placed in their proper realistic proportions. Effective reassurance confined itself to presentation of facts, and avoided empty expressions of confidence.

7. *Explanation*.—Patients frequently derived great benefit from explanation of the cause of their symptoms. They were greatly aided by an understanding of what may be termed the normal battle reaction,

i. e., the normal psychologic and somatic symptom complex resulting from battle fear. In appropriate cases the therapist could demonstrate that the patient's symptoms did not deviate in any important respect from this normal reaction.

8. *Manipulation of secondary gain.*—It became quite apparent to combat psychiatrists in the course of the war that the secondary gain to a person with neurotic illness was important in causing and perpetuating psychiatric disabilities in the troops. Illness could remove a man from the danger of battle and place him in the safety and comfort of a medical department installation. It could eventually result in his permanent removal from combat, or even in his return to the United States and discharge from the Army. Illness paid off, while health resulted in continued exposure to danger and deprivation.

Psychiatrists came to recognize the importance of this factor of secondary gain, and undertook to neutralize it if possible, as part of the therapy. Thus as soon as it had been determined that a given patient would not be returned to combat duty, the patient was informed of the decision. He was given reason to believe that this disposition was firm and not subject to reversal. This achieved removal of tension and pressure which resulted from anticipation of possible return to combat and eliminated further unconscious striving for the secondary gain of the illness.

Occasionally, symptoms were greatly ameliorated following a firm disposition to full combat duty. Such symptomatic improvement appeared to result from the fact that, in the face of an irrevocable disposition to full combat duty, symptoms became a burden instead of providing gain. In a few cases, secondary gain was manipulated by delaying the patient's evacuation until certain specified symptoms had subsided. In these cases, it was made clear to the patient that he would be evacuated and reclassified to noncombat duty, but that this would not occur until certain symptoms had cleared. Similarly, it was sometimes worthwhile to point out to patients from noncombat organizations the possible change in status that might accrue from illness and hospitalization. Hospitalization of a noncombat soldier, appearance before medical boards, and assignment to replacement depots always entailed some slight possibility that in the course of the administrative procedures he might be assigned to combat duty. Pointing this out was frequently therapeutically valuable.

9. *Sedation.*—The sedation policy followed in Seventh and Fifth Armies in 1944-45 represented a crystallization of previous experience. All sedation prescriptions were individualized. Each patient was interviewed briefly for screening purposes on admission. Generally, patients who had been on the battlefield a few hours before

1944, 39 percent of the patients admitted to divisional psychiatric facilities were returned to combat duty. In the same period, 24 percent of the patients admitted to army psychiatric facilities were returned to full duty. The consolidated figure for both divisional and army facilities was 46 percent. During the period 1 January to 24 May 1945 the corresponding figures were: divisions, 53 percent; army, 43 percent; and consolidated return to duty rate, 63 percent.<sup>12</sup> During the action of the Tenth Army on Okinawa, 83.6 percent of all hospitalized psychiatric patients were returned to full duty during the "first phase" (through 7 May 1945); 22.3 percent of the patients were returned to duty<sup>13</sup> (subsequent to 28 May 1945). In the First Army, over its entire period of combat experience (June 1944 to May 1945), division and army psychiatric facilities returned 51 percent of all patients to full combat duty.<sup>14</sup>

None of these figures take into account those psychiatric patients who were returned to full duty from battalion and stations. It has been estimated that at least 60 percent of all psychiatric patients were sent to full duty from this treatment level. Statistics regarding the percentage of neuropsychiatric patients returned to full combat duty from a given echelon or treatment station reflected not merely the quality of psychiatric treatment at that point, but also many other factors. For instance, if psychiatric screening and treatment were excellent in the latter echelon forward of the given psychiatric treatment installation, the latter would receive a large proportion of cases fit only for further evacuation. Consequently, its return to duty rate would be low. Similarly, if the divisions supported by a given psychiatric treatment installation were old veteran organizations, a high percentage of patients reaching the installation would be "burned-out" veterans who could not be returned to combat. Under such circumstances, the return to duty rate would be lower than when the divisions supported were new, fresh divisions.

#### FOLLOW-UP STUDIES

The efficacy of forward area treatment methods, as measured by subsequent performance of patients on duty assignments, was studied by

- <sup>12</sup> LEWIS, A. O. Final summary and critique of Seventh Army Psychiatric Service for Historical Report. Submitted to Surgeon, Seventh Army. 7 July 1945. Submitted to Surgeon Tenth Army. 1 July 1945.
- <sup>13</sup> MARKS, W. G. Neuropsychiatric service of First United States Army in European campaign—1944 and 1945. Submitted to Office of Surgeon General, U. S. Army.



by Glass<sup>16</sup> and by Ludwig and Ranson.<sup>17</sup> The former showed that 48 percent of patients returned to full combat duty had performed effectively after such return to duty. The figures of Ludwig and Ranson were in essential agreement with this. Ludwig and Ranson also found that of the patients evacuated from army psychiatric treatment facilities to the base, and subsequently reassigned within the theater to non-combat jobs, 93 percent had performed satisfactorily or better. At the time of this follow-up (from 6 to 8 months after evacuation from Seventh Army), 86.6 percent of the evacuated patients had been assigned to duty in the theater in noncombat assignments. Only 4.2 percent had been rehospitalized before reaching a new assignment, and only 9.2 percent had been evacuated to the United States as patients.

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<sup>16</sup> GLASS, A. H. Quoted in Appendix I, Statistical Studies Bull U S Army M. Dept. (Supp.) pp 200-202 Nov. 1949

<sup>17</sup> LUDWIG, A. O., and RANSON, S. W. Statistical follow up of effectiveness of treatment of combat-induced psychiatric casualties. I. returns to full combat duty, II. evacuations to base. Mil. Surgeon 100: 51-62, Jan 1947 169-175, Feb 1947.



with diabetes who was still highly resistant after more than 5 years. In this particular patient, 3,000 to 5,000 units of insulin daily were required over extensive periods to achieve a reasonably good degree of diabetic control.

The term insulin resistance is applied when more than 300 units of insulin daily is required for the control of diabetes. Although we have no exact information as to the amount of insulin secreted by normal man, the best estimate places the amount at about 200 units a day. The literature contains reports of totally depancreatized persons\* (usually for malignancy) in whom the postoperative insulin requirements ranged from 40 to 100 units. It is hardly tenable that a normal man produces only 40 units a day. The explanation of complete control of totally depancreatized persons with such minor amounts of insulin can be found in the examination of the case records, viz. a small amount of food was ingested and a profound state of cachexia existed. The more profound the cachexia, with its concomitant factors of undernutrition, malabsorption, malassimilation, and greatly reduced basal state, the more hypersensitive is the individual to even trivial amounts of insulin, as shown by Allen.<sup>2</sup> Since the normal person produces only a few hundred units a day, the hyporesponsive state cannot be predicated solely on a basis of quantitative insulin production or requirement. The most probable conception is that these persons produce some unknown substance, antihormone or some insulin-neutralizing or insulin-destroying substance, and that this unknown substance, which is not normally present, is able to destroy relatively large amounts of exogenous insulin which normally are far beyond the ability of the human organism to produce.

No patient may be said to be wholly nonresponsive to insulin. Some patients with diabetes have died in coma; however, they probably would have been revived if larger amounts of insulin had been employed. There are several instances of recovery from diabetic coma with doses of 3,000 units a day. In one instance of recovery 19,000 units were employed.<sup>3</sup> It is believed that if treated heroically with enormous doses of insulin, all patients in coma probably would be revived. The rate at which insulin is destroyed in the body is in direct proportion to the size of the dose.<sup>4</sup> Although insulin resistance

\* RICKETS, H. T., BARNSCHWIG, A., and KNOWLTON, K. Effects of total pancreatectomy in patient with diabetes. *Am. J. Med.* 1: 229-245 Sept. 1946.  
 ALLEN, F. M. Treatment of diabetes with insulin. *J. A. M. A.* 81: 15-21 1923.  
 Oct. 26 1923.  
 \* BURLIN, R., CHIST, P., PIETTE, M., and CHACERLOT: Sur un cas de coma diabétique avec insulino-résistance réduite par l'administration intraveineuse de 19 000 unités d'insuline. *Bull. et mémoires Soc. méd. d'hygiène de Paris* 43: 395-601 1947.  
 CREELEY, P. O. Duration of insulin action. *Am. J. Physiol.* 129: 17-21, Apr. 1940.

orously participate in these reactions. Later, the emotions of fear, anger, and depression become differentiated by stimuli organization, thought content, and type of activity. All of these involve tense physiological disturbances, and these disturbances continue as a chief outlet or expression of emotions. These physiological disturbances acquire a pattern through repetition, and often become characteristic of the individual. The physiological manifestations in characteristic form for a given individual frequently tell a story by themselves. Thus, nausea may be the expression of dissatisfaction or disgust; diarrhea, of insecurity or worry; colitis and migraine, of anger; tachycardia and palpitation, of fear; and constipation, of restraint, resistance, and stubbornness. These physiological responses frequently make themselves more important than their psychological content, and so justify the patient in his illness. Unfortunately, if these mechanisms are not fully understood, they may be mishandled, and the symptom complex becomes more firmly fixed in the individual's mind.

#### CARDIAC SYMPTOMS

Much harm can be done when a physician in the absence of sufficient evidence, unthinkingly tells the patient he has heart disease. Every physician knows that he cannot be certain whether or not the heart is structurally damaged, and, in the absence of such knowledge, it is natural for him to be cautious. But by being cautious he sometimes causes the patient to become overly apprehensive. If he warns a man never to run for a train or run upstairs, never to walk into a strong wind, or never to lose his temper, he may create such damage to the patient's psychological mechanism that the individual becomes an invalid. Although pain and breathlessness are cardinal symptoms of heart damage, they are also present in the so-called cardiac neuroses.

An accurate assessment of symptoms is the best means of differentiating between structural damage and cardiac disorders due to emotional disturbances (5). Such a differentiation is essential to intelligent handling of the heart patient. On the other hand, it is necessary to remember that the patient with structural damage to the heart also is often anxious and emotionally disturbed, and many of his complaints may be the result of this disturbance, rather than of his heart lesion.

When children suffer from rheumatic heart disease, they usually also have emotional problems, and these are frequently precipitated by the parents. The bugaboo of rheumatic fever is the ever-present danger of recurring attacks with further damage to the heart. It is difficult to instruct a mother to be on the lookout for vague symptoms of reinfection, which are the common ones in childhood, without arousing undue anxiety in her, and eventually in the child. If we do

is not specifically confined to diabetes, nevertheless in nonresponsive patients diabetes obeys the same laws and principles as in ordinary diabetes. If insulin is omitted the patients go into coma; if excessive doses of insulin are employed, mild or severe reactions may occur; insulin requirement increases with intercurrent infections and also fluctuates with alterations in body weight just as in usual diabetes. The doses cited above are extreme instances. Some insulin-insensitive patients, reported in the literature, have required not more than from 500 to 900 units for good control, over periods of many months. Once insulin resistance is established there is an increasing demand up to a certain maximum point; a plateau-like level is finally reached and, after weeks or months, this is followed by a gradual reduction in insulin demand. Frequently, as in the case presented here, infection plays a very important role; in our patient an infectious process associated with a gangrenous extremity on two separate occasions called for an unusual increase in insulin demand.

This unusual refractiveness to insulin is characteristic of only a few other hormones except perhaps the parathyroid. Lissner and Shepardson<sup>10</sup> encountered unusual resistance to parathyroid extract in a patient with parathyroid tetany. Clinicians frequently encounter patients who, for some unexplainable reason, are not affected adversely by large (0.6 or 1.0 gram) doses of desiccated thyroid extract. Ability to tolerate larger doses without evidences of therapeutic hyperthyroidism is not recorded, except in a few rare instances in which failure of absorption from the intestinal tract is evident. To assume that a person is resistant or hyporesponsive to the thyroid hormone would mean that he required or could tolerate as much as from 200 to 300 grains of thyroid extract in 24 hours in order to control clinical manifestation of myxedema. No such peculiarly resistant situation has been reported to date. There are a few reports of resistance to estrogenic substances or to desoxycorticosterone acetate.

Insulin resistance is not to be confused with certain states associated with temporary increases of insulin requirement. In diabetic acidosis there is a temporary increase in insulin demand. Uncontrolled diabetes, improperly balanced diets, high-fat diets, high-carbohydrate diets, and high-calorie diets require relatively large doses of insulin, but these are explainable. There is a temporary increase in insulin requirement in the presence of infections; the requirement increases as the infection increases, but this rarely exceeds a few hundred units over a brief period of time and subsides quickly as the infection dimin-

<sup>10</sup> Lissner, H., and Shepardson, H. C. Further and final report on case of tetania parathyroidea treated for year with parathyroid extract (collip), with eventual death and autopsy. *Endocrinology* 13: 427-454, Sept.-Oct. 1929.

sons. There is no relationship between the duration of diabetes, the severity of the disease, the type of insulin, or the previous state of diabetic control. We know very little about the action of insulin although it has been in use for almost 30 years.

*Biochemical function of insulin.*—It has been long recognized that glucose utilization and oxidation are not entirely dependent on the action of insulin. The part played by the hormone in these physiologic actions is still in doubt. The importance of insulin in making possible carbohydrate storage in the form of glycogen and fat was first stressed by Drury<sup>14</sup> and Pauls and Drury.<sup>15</sup> This work has been amply confirmed by isotope tracer studies.<sup>16</sup> Beyond the fact of carbohydrate storage, principally as fat, there is little agreement concerning the over-all action of insulin. The biochemical details of this storage function are not known. Probably the first step in the utilization of glucose for any purpose is the formation of glucose-6-phosphate under the influence of the enzyme hexokinase. The recent articles by Cori and his coworkers<sup>17,18</sup> suggested that the action of insulin was hexokinase action, if not actively, by removing the inhibition of the anterior pituitary or adrenal cortex hormones. However, Stadie and Haugaard,<sup>19</sup> Mirsky and Broh-Kahn,<sup>20</sup> and others have failed to show any alteration of the hexokinase reaction in muscle or kidney extracts from diabetic rats when compared with normal controls. It is very probable that insulin is concerned with the early phase of glucose oxidation. The normal blood pyruvate response obtained on administration of glucose is absent in the depancreatized dog or patient with diabetes unless insulin is given simultaneously.<sup>21,22</sup> Recent work from this laboratory involving the administration of radioactive carbon-labeled glucose with and without insulin, to eviscerated rabbits, indicates that insulin accelerates the formation of a

<sup>14</sup> DRURY, D. R. Role of insulin in carbohydrate metabolism. *Am J Physiol* 131: 536-543 Dec 1940.

<sup>15</sup> PAULS, F. and DRURY, D. R. Influence of insulin upon glycogen storage in diabetic rat. *J Biol Chem* 143: 481-485 Oct 1942.

<sup>16</sup> STETKEY, DEW. JR. and FOERER, G. E. Studies in carbohydrate metabolism: metabolic defects in alloxan diabetes. *J Biol Chem* 138: 271-278 Nov 1944.

<sup>17</sup> COLOWICK, S. P., CORI, G. T., and STEIN, M. W. Effect of adrenal cortex and anterior pituitary extracts and insulin on hexokinase reaction. *J. Biol. Chem* 169: 563-566 May 1947.

<sup>18</sup> PRICE, W. H.; CORI, C. F. and COLOWICK, S. P. Effect of anterior pituitary extract and of insulin on hexokinase reaction. *J Biol Chem* 169: 633-634 Oct 1945.

<sup>19</sup> STADIE, W. C. and HALGAARD, N. Hexokinase reaction in tissue extracts from normal and diabetic rats. *J Biol Chem* 177: 311-324 Jan 1949.

<sup>20</sup> MIRSKY, I. A. and BROH-KAHN, R. H. Hexokinase activity and diabetes mellitus. *Science* 106: 148-149 Aug 15 1947.

<sup>21</sup> RUEDING, E., FICKER, J. F.; HERBLICH, H.; and HENNING, H. E. Effect of insulin on pyruvic acid formation in depancreatized dogs. *J Biol Chem* 148: 97-104 Apr 1943.

<sup>22</sup> LEEDING, I., WORTIS, H., FRIIS, H. D. and FSTEROSKE, D. Pyruvic acid metabolism in diabetes mellitus. *Am J M. Sc.* 294: 838-843, Dec. 1942.

water-soluble metabolite. Further work is being carried out on these studies.

*Absorption of insulin.*—A consideration of the failure of absorption of insulin from the site of injection is important; however, we have no data that lead us to believe that absorption of insulin in the hyporesponsive patient is any different from that in the usual patient with diabetes. Insulin is administered in a watery solution and readily permeates all tissues. Insulin-resistant persons are equally resistant to large amounts of intravenously administered or subcutaneously injected insulin. Root et al.<sup>23</sup> in 1944 showed that there was a minor delay in absorption of radioactive insulin in resistant individuals as compared with controls, but there was nothing to suggest failure in total quantitative absorption. Furthermore, we now question the chemical composition of the material used and assumed to be radioactive insulin.

*Excessive loss of insulin in the urine.*—In the early years following the discovery of insulin one of the explanations for insulin resistance pertained to undue loss of insulin through the urine. With improvements in insulin assay methods and more complete study, we now know that the amount of insulin lost in the urine is negligible in normal, diabetic, and hyporesponsive patients. Very little is known about the excretion of the end products of insulin in the urine, if any. Mirsky et al.<sup>24</sup> demonstrated that the average daily excretion of urinary insulin was only 0.04 units per day in normal persons and 0.03 units in diabetic persons; also that mere minute fractions of very large amounts of injected insulin were excreted by either subject. Insulin-resistant patients ordinarily excrete no more insulin than normal persons and when injected with very large amounts of exogenous insulin show no increase in urinary output. This leads to the assumption that insulin is destroyed in the human body.

*Allergy.*—Local sensitivity to insulin in such forms as wheals, urticaria, painful nodules at the site of injection, or lipodystrophy<sup>25</sup> is not to be confused with hyporesponsiveness or insulin resistance. However, about 10 percent of the insulin-resistant patients did exhibit local allergic manifestations to insulin. The use of highly purified forms of insulin and recrystallized insulin in several instances has not brought about a decrease in demand for insulin or served to make

<sup>23</sup> ROOT, H. F., and others: Absorption of insulin labelled with radioactive iodine in human diabetes. *J. A. M. A.* 124: 54-59 Jan 8, 1944

<sup>24</sup> MIRSKY, I. A., ET AL.: Urinary excretion of insulin by normal and diabetic subjects. *J. Clin. Investigation* 27: 515-519, July 1948.

<sup>25</sup> OESTREICHER, D. L., and WATSON, E. M.: Insulin fat atrophy. *Am. J. M. Sc.* 218: 172-178, Aug 1949

patients any less resistant. There are many references in the literature citing the coexistence of local skin reaction and temporary increases in insulin requirement in which it is concluded that the patients were allergic to insulin. Full supporting evidence, however, is not sufficient to be convincing. Allan and Scherer<sup>26</sup> in 1933 presented the findings of a 55-year-old woman with diabetes who showed urticaria and wheals, whose insulin requirement was moderately excessive. It was assumed that the resistance was of an allergic character. She had many complications—acidosis, Hodgkin sarcoma, and coronary heart disease, which today would be considered as factors in increasing the insulin requirement rather than to assume that some allergic factor was responsible.

In all probability, local sensitivity and allergic reactions result from impurities in commercial insulin. Because insulin is a protein it might easily be contaminated with other proteins or split products of questionable nature. Too little attention has been paid to the actual purity of insulin, and in some important articles on the immunization of animals against insulin the question of the purity of the insulin used as an antigen has been overlooked. Recently Jorpes<sup>27</sup> has shown that allergic reactions were universally eradicated by the use of insulin that had been purified by recrystallization. Three hundred diabetic patients who showed localized or generalized reactions became symptom-free when insulin which had been recrystallized from three to five times was substituted for the ordinary commercial product.

*Immunity to insulin.*—In 1935 Banting et al.<sup>28</sup> published a report of a nondiabetic schizophrenic patient who built up a remarkable increase in tolerance to insulin exceeding 1,000 units during the course of insulin shock therapy. The initial treatment with 20 units of regular insulin reduced the blood sugar level to 0.050 mg per 100 cc, whereas after 50 treatments there was very little reduction in the blood sugar level with 1,000 units of insulin. An immune reaction was discussed as a likely possibility.

In view of the size and complexity of the insulin molecule, some degree of antibody formation might occur. Although the molecule contains nine or more aminoacids and 3.2 percent sulfur, we cannot assume that it is antigenic. It is further illogical to consider that a substance which is present as a normal part of the organism should be physiologically antagonistic to the same organism. If it were

<sup>26</sup> ALLAN F. N. and SCHERER, L. R. Insulin resistance due to allergy, with report of case. *Am. J. M. Sc.* 143: 815-821, June 1933.

<sup>27</sup> JORPES J. E. Recrystallized insulin for diabetic patients with insulin allergy. *Arch. Int. Med.* 83: 763-771, Apr. 1949.

<sup>28</sup> BANTING F. G., FRANK W. R. and GARRIS S. Anti-insulin activity of serum of insulin treated patient. *Am. J. Psychiat.* 95: 362, 1938.







# Carcinoma of the Prostate

JAMES C. KIMBROUGH, Colonel, MC, U. S. A.<sup>1</sup>

IN THE 10-year period ending 31 December 1949, 435 patients were operated on for benign prostatic hypertrophy in this hospital. In the same decade, 78 patients were treated for carcinoma of the prostate, a total of 513 patients with prostatic enlargement (table 1).

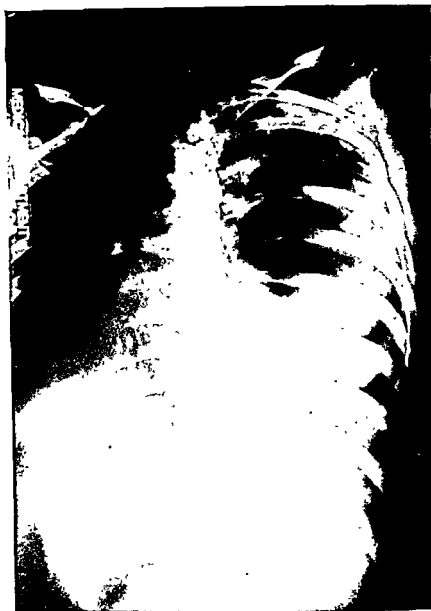
TABLE 1.—Number of patients with prostatic enlargement in 10-year period

Year	Patients with benign hypertrophy	Patients with carcinoma	Total	Percent with carcinoma	Patients treated by perineal prostatectomy	Percent of patients with carcinoma treated by prostatectomy
1940.....	42	10	52	19.2	1	10
1941.....	49	3	52	5.7	0	0
1942.....	29	4	33	12.7	0	0
1943.....	32	4	36	11.0	1	25
1944.....	26	4	30	13.3	2	50
1945.....	41	2	43	4.9	2	100
1946.....	50	7	57	12.3	3	42.9
1947.....	50	18	68	26.5	13	72.9
1948.....	59	14	73	19.2	9	64.3
1949.....	57	12	69	17.4	8	66.7
Total.....	435	78	513	15.2	39	60

**Treatment.**—Radical perineal prostatectomy was performed in 39 (50 percent) of the patients with carcinoma. In the remaining 50 percent the carcinomatous process had spread by local extension or by metastases beyond the limits of surgical eradication; these received only palliative treatment. Important advances have been made in the palliative treatment of carcinoma of the prostate. Although the life of the patient has been prolonged and made more comfortable, the only cure is complete surgical eradication of the cancerous process, which is possible only if the malignancy is detected before spread beyond the limits of the prostate gland has occurred.

**Diagnosis.**—Digital rectal examination is the most important procedure in early diagnosis. Pain, dysuria, and other subjective symptoms appear too late in the course of the disease for surgical cure, and

<sup>1</sup> Walter Reed Army Hospital, Washington, D. C.



*Figure 1—Preoperative roentgenogram.*

*Operation*—The patient was anesthetized with pentothal sodium and curare intravenously plus nitrous oxide and oxygen intratracheally. The blood pressure became unobtainable and blood was administered by forced pressure, using the three-way stopcock technique. The patient rallied and the abdomen was entered through a left upper rectus muscle-splitting incision. Large quantities of blood

and blood clots were evacuated from the peritoneal cavity. There was a radial tear in the left diaphragm extending from the esophageal hiatus almost to the periphery. The stomach, spleen, and left lobe of the liver were reduced from the chest and inspected. There were two small insignificant lacerations of the liver. The ruptured and bleeding spleen was removed and the vessels were ligated with silk. Blood clots and blood were evacuated from the left pleural cavity, in which the lung was completely collapsed. The diaphragm was repaired with a series of interrupted through-and-through silk sutures. Further exploration revealed a hematoma in the left kidney region. The posterior peritoneum was incised, exposing a lacerated and bleeding left kidney. The kidney was removed and the vessels and ureter were ligated with silk; the posterior peritoneum was then closed with a continuous catgut suture. The abdominal incision was closed in layers without drainage and the left phrenic nerve was exposed through a low cervical incision and crushed with a hemostat. The patient received 2500 cc. of blood during the procedure.

*Diagnosis.*—Traumatic rupture of the diaphragm, spleen, and left kidney.

*Pathologist's report.*—The spleen measured 12 by 8 by 4 cm. and weighed 200 grams. The capsule was smooth and thin and the tissues firm. At the hilus and anterior margin there was a large, jagged, "bursting" type of laceration measuring 7 cm. through which macerated tags of splenic pulp and blood clot protruded. On section, the remainder of the splenic tissues appeared normal.

The left kidney measured 10.5 by 6 by 3 cm. and weighed 145 grams. The capsule had been stripped and the surface was smooth. A jagged linear rupture line extended through the upper pole to the hilus, almost completely separating the upper pole from the rest of the kidney. The pelvis and stump of ureter appeared normal.

*Postoperative treatment and course.*—The patient was returned to the ward in good condition and placed in an oxygen tent. Continuous gastric suction through a Levin tube was begun and the legs were wrapped with elastic bandages. Another 700 cc. of blood were administered, and the patient was given penicillin, procainamine, fluids parenterally, vitamins, and protein hydrolysate. The pulse and blood pressure remained stable, but there was some cyanosis and dyspnea; a roentgenogram demonstrated complete collapse of the left lung. A thoracotomy was performed in the left seventh interspace and a 14F catheter was inserted and connected to a Watanabe suction apparatus.

The patient's condition was satisfactory on the first postoperative day. The left lung was completely reexpanded and the thoracotomy tube was removed. The patient was able to take deep breathing exercises and to exercise the legs regularly; the elastic bandages were removed.

On the second postoperative day the red blood cell count, urine, blood urea nitrogen, serum protein, and chloride were all normal. The 24-hour urinary output was 2675 cc. and the temperature 100.6° F.

On the third postoperative day peristalsis was active and the gastric suction was discontinued. Fluids were given by mouth. The clips were removed from the neck incision. Oxygen was discontinued.

The remainder of the postoperative course was uneventful except for thoracocentesis on two occasions to remove some amber fluid from the left pleural space. A chest roentgenogram (fig. 2) on 10 April 1960 was normal except for a slight elevation of the left diaphragm. On 11 April 1960 the patient left on convalescent leave, entirely asymptomatic. She returned to duty 1 month later.



arouse too much anxiety, then the mother will overprotect her child, worry over him, fuss over him, keep him in bed long hours, urge him to eat, and be alarmed at the slightest headache or evidence of fatigue. On the other hand, an overanxious mother may, because of her fear, also be blind to obvious signs of trouble and assume a casual attitude, which may be even more damaging than the over-solicitous one.

If the child is so recovered from his illness that he can regain a place in the world no matter how handicapped he may be, he must be taught the two most difficult lessons of childhood—if not of life. One is to defer an immediate satisfaction for an ultimate gain. The other is to accept certain inexorable limitations of his capacity. He will learn these lessons best if he is not overburdened with anxiety.

In the individuals who suffer from so-called cardiac neurosis, anxiety is of cardinal importance. These individuals report unpleasant, often frightening sensations, which they attribute to their heart. They complain of such symptoms as tachycardia, palpitations, and sometimes even extrasystoles.

We know that outbursts of rage, or startle reactions, as from fright or the hearing of bad news, are sometimes followed by sudden cardiac failure. Every cardiologist is aware of the effects of anxiety or emotional tension on the coronary circulation. We have all noticed the sudden rise of blood pressure when putting on the manometer cuff.

### ENDOCRINE SYSTEM

For many years it has been known that the emotions affect the endocrine system, whether it is the adrenal glands, the pancreas, or the thyroid. Even the surgeon has to admit that hyperthyroidism is not a disease entity but a group of symptom-complexes with a fairly definite course, evolving from autonomic imbalance and characterized by the signs of fear and anxiety, such as tachycardia, tremor, and a heightened basal metabolic rate. The organic changes such as enlargement of the thyroid gland and various degrees of exophthalmos do not come until late in the disease, but early in the course the person takes on the appearance of being chronically frightened.

It is an accepted fact that there is a close relationship between the thyroid and the sex glands, and it is interesting to note that exophthalmic goiter is more common in women than in men. Perhaps the sex history will give an indication of the cause. Certainly, in every case of exophthalmic goiter the family history will indicate an unstable background, and the onset of the symptom complex will be dated to a period of worry or mental shock. Whether the practitioner is a surgeon or an internist, no one now seriously doubts the fact that the inherent constitution of the patient is a determining factor; and yet there are still those who insist that exophthalmic goiter is a

# Empyema In Infancy

JAMES A. DOUCETT, *Captain, MC, A. U. S.*<sup>1</sup>

JOHN T. BOWERS, *First Lieutenant, MC, A. U. S.*<sup>2</sup>

THE treatment of empyema in infants and children was primarily surgical prior to the advent of penicillin therapy. Numerous methods of draining the empyema cavity had been tried but uniformly poor results were obtained, particularly in infants under 2 years of age. This situation has been greatly improved, first with the advent of sulfonamide therapy in conjunction with repeated thoracentesis, and later, and more dramatically, with penicillin. The case presented here demonstrates what can be expected from early institution of adequate penicillin therapy in conjunction with repeated thoracentesis in those patients harboring a penicillin-sensitive organism.

## CASE REPORT

A 7-week-old white female infant was admitted to this hospital on 9 March 1950. Her parents reported that she had had a cold, manifested by cough, low-grade fever, and a serous nasal discharge, for about 2 weeks prior to admission. About 24 hours prior to admission, she developed respiratory distress with dyspnea and cyanosis that persisted to the time of admission.

Physical examination on admission revealed a moribund, poorly nourished and poorly developed white female infant with cyanosis and respiratory distress. The respirations were shallow and feeble and respiratory excursions were definitely limited on the left side. Tachypnea with frequent episodes of apnea were noted. There was slight inflammation of the pharynx. The tympanic membranes were normal. Examination of the chest revealed flatness to percussion over the entire left side of the chest, with absent breath sounds over the same area. The trachea was displaced to the right. The heart sounds were distant, of poor quality, and there was tachycardia. The abdomen was distended with gas but no masses or organs were palpable. The rectal temperature was 100.2° F. The patient weighed 8 pounds 6 ounces.

The leukocyte count was 13,400, with 45 percent polymorphonuclear cells, 54 percent lymphocytes, and 1 percent monocytes. The erythrocyte count was 2,910,000 with 10 grams of hemoglobin. Throat culture taken at the time of admission yielded hemolytic *Staphylococcus aureus*.

A roentgenogram of the chest (fig. 1) at the time of admission showed complete obliteration of the left pleural space by fluid, with displacement of the trachea and mediastinum to the right, consistent with the clinical diagnosis of massive empyema of the left side of the chest. Slight improvement occurred

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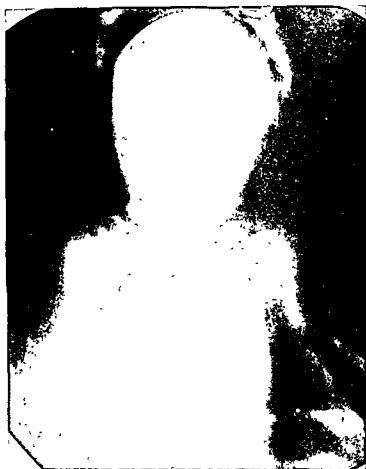
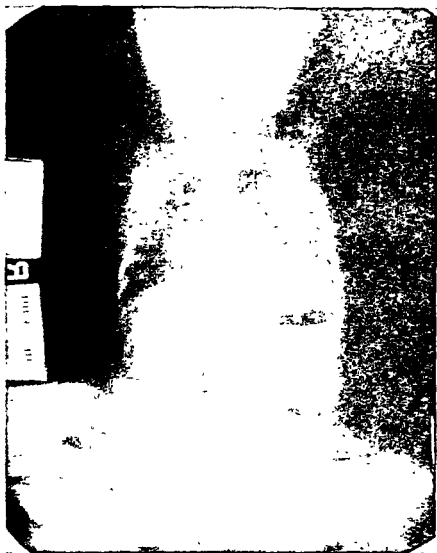


Figure 1.—Roentgenogram at time of admission, showing massive empyema of the left side of chest and shift of the trachea and mediastinum to the right.

after oxygen was administered. A thoracentesis was performed; 107 cc of yellow green purulent material was slowly withdrawn and 75,000 units of penicillin dissolved in 3 cc of normal saline solution was introduced into the pleural space. A stain of the material removed showed gram-positive cocci. A pure culture of hemolytic *Staph aureus* was recovered.

On removal of the purulent fluid from the left pleural cavity, the infant's general appearance immediately improved. She became less cyanotic, the respiratory distress decreased, the trachea shifted toward the midline, and breath sounds were again audible over the left side of the chest. A postthoracentesis roentgenogram of the chest (fig 2) showed an area of increased density in the left periphery, overlying the scapula. The infant was given 100,000 units of crystalline penicillin intramuscularly every 3 hours. On the second hospital day the left pleural space was again aspirated, 20 cc. of purulent material was obtained, and 100,000 units of penicillin was injected into the pleural space. Culture of the aspirated material yielded no growth. The leukocyte count was





*Figure 2.—Roentgenogram following initial pleural aspiration, showing clearing of the left lung field and return of the trachea and mediastinum toward the midline.*

7590, with 21 percent polymorphonuclear cells, 76 percent lymphocytes, and 3 percent monocytes. The infant's condition was much improved, there was no cyanosis, the respiratory rate was normal, the respirations were regular and equal bilaterally, and the temperature was normal.

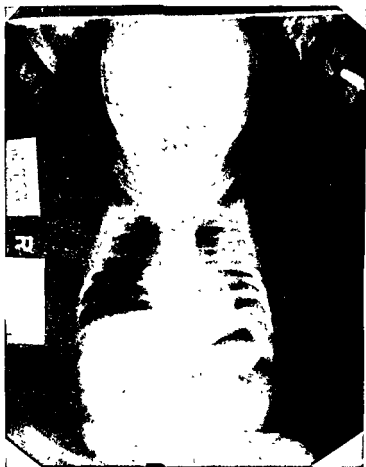
On the third hospital day, thoracentesis was again attempted but no pus was obtained. Transfusions of whole blood were given on the third and fifth hospital days. There was no further cyanosis or dyspnea and the physical examination was essentially normal. The infant's appetite improved. A roentgenogram of the chest (fig. 3) was taken on the fifth hospital day, and fluoroscopy confirmed the belief that the density previously described in the left periphery was caused by pleural thickening.

The course thereafter was entirely satisfactory. The temperature remained normal, the appetite improved, and the weight increased. On the eighteenth hospital day the dose of penicillin was reduced to 100,000 units every 6 hours, and on the thirty-third hospital day the drug was discontinued. The infant was

discharged on the thirty-fifth hospital day. Her weight at the time of discharge was 10 pounds 1 ounce. A roentgenogram taken 34 days after the initiation of therapy (fig. 4) showed the lung fields to be completely clear.

### DISCUSSION

Empyema in infancy and childhood occurs most often as a complication of pneumonia. Prior to the advent of sulfonamide and penicil-

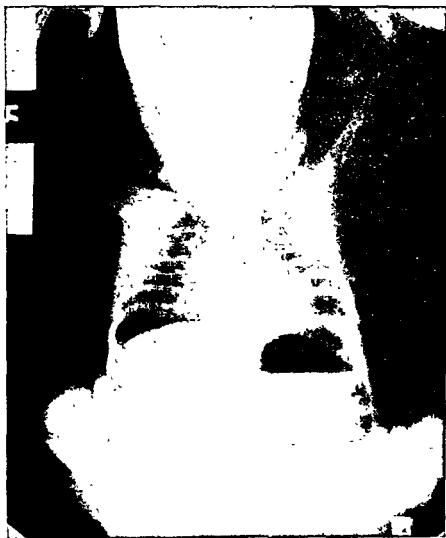


*Figure 3—Roentgenogram taken on fifth hospital day.*

therapy, the pneumococci were the most common causative agents. In order of frequency were the hemolytic streptococci, *Staph. aureus*, and rarely the influenza, typhoid, Friedländer, and colon bacilli.<sup>2</sup> Adequate therapy of pneumonia with sulfonamides and/or

penicillin has greatly reduced the incidence of empyema, particularly those forms caused by pneumococci and hemolytic streptococci.<sup>3</sup>

Prior to penicillin therapy, the age of the patient was an important factor in determining the mortality from this disease, with the high case-fatality rates occurring in infants under 2 years of age, and decreasing as the age of the child increased.<sup>4</sup> Thus, Lanman and



*Figure 4—Roentgenogram showing essentially normal chest.*

Dimmler,<sup>5</sup> reporting a series of 467 children with empyema, found the case-fatality rate among those under 2 years of age to be about twice

<sup>3</sup>NELSON, W. E. *Mitchell-Nelson Textbook of Pediatrics*. 5th edition. W. B. Saunders Co., Philadelphia, Pa. 1950. pp. 1011-1015.

<sup>4</sup>PENBERTHY, G. C., and BENSON, C. D. Management and treatment of empyema in children. *Am J Surg* 39:267-274, Feb. 1938.

<sup>5</sup>LANMAN, T. H., and DIMMLER, C. L., JR. Management of acute empyema in children. *Am J Surg* 51:29-34, Oct. 1941.



*Figure 1.—Preoperative view showing extent of the radicular cyst in the right mandible.*

were vital. Roentgenograms of the lateral and anterior-posterior extraoral aspects of the right mandible revealed a large area of radiolucency extending from the mesial root of the second molar to the symphysis of the mandible (figs. 2A and 2B) which had caused definite



*Figure 2A.—Preoperative roentgenogram of radicular cyst in the right mandible.*

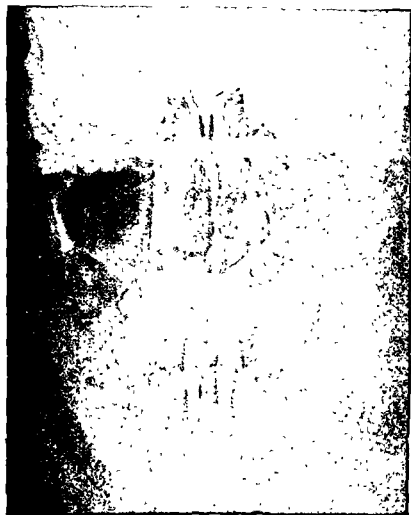


Figure 2B.—Preoperative roentgenogram of radicular cyst in the right mandible.

expansion and thinning of the bone on the superior and lateral borders. A diagnosis of radicular cyst was made and the patient was prepared for operation.

#### *Operation*

*Oral surgical procedure.*—Under intratracheal anesthesia with nasal intubation, an incision was made at the lower border of the mandible, extending from the angle to the symphysis. Two percent procaine hydrochloride with epinephrine was infiltrated locally for hemostasis. The soft tissues were reflected upward and the entire buccal plate of the mandible was exposed. The cyst, about the size of a hen's egg, was excised en masse. Hemostasis was secured by gelfoam at the bleeding points in the bony cavity. The cystic contents were examined by the pathologist and found to be sterile. A cancellous bone graft was taken from the left iliac crest, divided into chips, and gently packed in the bony cavity. The soft tissues were sutured over the

defect and a pressure dressing was applied. A drain was inserted to prevent the formation of a hematoma.



*Figure 3.—Postoperative view. The jaw is firmly healed and there is no evidence of recurrence of the cyst.*



*Figure 4.—Postoperative roentgenogram 5 months later shows healing and consolidation of bone chips.*

*Procedure in elevating bone graft.*—An incision was made over the crest of the left ilium. The soft tissues were elevated and retracted and the periosteum was stripped from the bone. The cortical plate of bone at the iliac crest was chiseled off, and a portion of the cancellous bone was chiseled out of the bed. This cancellous bone was divided into chips about the size of half a pea. The periosteum and soft tissues were sutured back in apposition.

*Postoperative course.*—The mandible was immobilized with Ivy loops and intermaxillary elastics to restrict the mandibular movements in order not to displace the bone graft by muscular activity. Penicillin, a liquid diet, and moderate sedation for pain were prescribed. The patient noted parasthesia of his lower lip and chin, which was to be expected after an operation of this sort; otherwise the postoperative course was uneventful. On the sixth postoperative day, the sutures were removed. The incision healed by primary intent (fig. 3). Periodic roentgenograms were taken, and by the fifth postoperative month, the bone chips appeared completely homogeneous and viable (fig. 4). The parasthesia of the lower lip persisted for 3 months, after which all sensation was normal. Soon after the operation, vitality tests of the molar and bicuspid teeth, whose roots were exposed in the cyst, were negative, but by the end of the second postoperative month they gave positive responses to cold, heat, electricity, and the bur, so they were not extracted.



surgical problem, and the cure is by extirpating this constitutional psychopathology.

There may be very severe symptoms associated with no evident thyroid enlargement, while on the other hand, the symptoms may be practically absent although there is glandular enlargement. The removal of a large part of the thyroid gland in a chronic and well-established case of exophthalmic goiter may result in a noticeable subsidence of the symptoms while in other cases the operation seems to have no effect. Thyroidectomy necessarily removes the patient from her home and thus may interrupt the vicious circle in which the patient lives. This may be all that is necessary to bring about a temporary symptomatic cure, but on the other hand it does not get rid of the primary cause of the trouble. The symptom complex, including the exophthalmos and rapid heart, may be simply a secondary result of an aggravating environment. In other words, the involuntary nervous system may be stimulated from without and not from within. Thus it is obviously necessary to consider not only the individual, but also his environment, for it is impossible to explain the symptoms of exophthalmic goiter from any common cause.

One thing is certain, the victim of exophthalmic goiter is a highly sensitive, irritable, or "touchy" individual, who responds to life with extreme delicacy. As a consequence he has an emotional life varying from ecstasy to profound depression. The individual is often manic and thrives on stimulation, and belongs essentially to the artistic type. Analysis of the history usually reveals that the psychopathology was already present long before the organic symptoms of the disease became manifest. The sensitive emotional personality explains why this syndrome is more common in women and why young children whose emotions are not fully developed are comparatively free from the disease.

If the physician has been able to follow the patient over any length of time before the onset of the symptoms and has witnessed the transition, he has, no doubt, been impressed with the fact that he has been witnessing nothing more or less than an exaggeration of a normal trend: for the emotional instability becomes greater, the manic tendencies more noticeable, the pulse more rapid, and the tremor more pronounced. In other words, the personality becomes hypertrophied. Even the organic evidences of the disease become exaggerated: the thyroid gland swells—or if it has been previously swollen it grows larger. The wide staring eyes become more prominent, and the basal metabolic rate becomes elevated.

The underlying personality is evidently a result of excessive protection by the parents, for the individual has been so shielded from possible harmful influences that when he reaches adult life he is



## MANAGEMENT OF LABOR

When labor had become definitely established, as evidenced by the quality and frequency of the uterine contractions and the progressive dilatation and effacement of the cervix, the patient received an initial dose of 100 mg. of demerol and 0.6 mg. of scopolamine. The timing of this initial dose depended on the stoicism and the pain threshold of the individual patient. Generally, primiparas received this medication when their pains were of good quality, occurred as often as every 3 minutes, and the cervix was dilated 4 cm. The timing of the administration of demerol and scopolamine to multiparas depended on parity, history of rapidity of previous labors, strength and frequency of labor pains, dilatability of the cervix, and, above all, the experience and clinical judgment of the attending obstetrician. In both primiparas and multiparas, if labor was still active 1 hour after the administration of the first analgesic, 100 mg. of demerol were given and repeated thereafter at 1- to 2-hour intervals, depending on the progress of labor. Scopolamine was seldom repeated after the initial dose.

Caudal analgesia was induced in primiparas when the cervix was nearly or fully dilated and the vertex in a normal anterior position. In multiparas caudal analgesia was induced when the cervix was dilated, 6 to 8 cm., depending on the activity of labor and the position of the presenting part.

## TECHNIC OF CAUDAL ANALGESIA

The malleable needle technic with 1.5 percent metycaine as the anesthetic agent was used for caudal analgesia. Several innovations

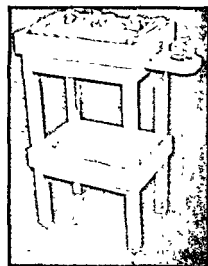


Figure 1.—Caudal tray stand.

not previously described were also applied. Figure 1 shows a readily constructed wooden stand to hold the caudal tray and figure 2, the tray at the patient's bedside. Figures 3 and 4 show a caudal roll that was used to keep the patient's weight off her abdomen while lying prone to facilitate insertion of the caudal needle.

After inserting the malleable needle, careful aspiration determined that the subdural space had not been entered. Eight cubic centimeters of the metycaine solution was then injected and in 5 minutes, if there was no paralysis of the lower extremities and again

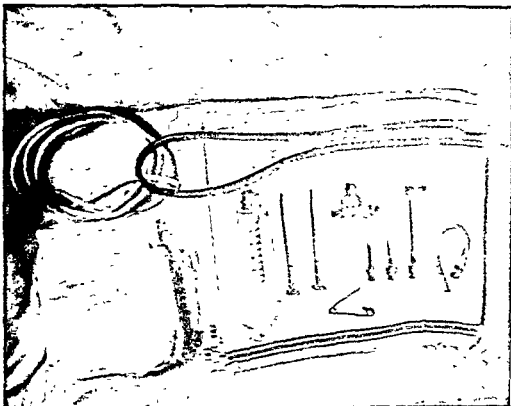


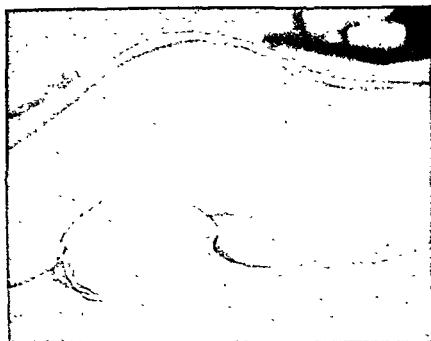
Figure 2.—Caudal tray.

after careful aspiration, the remaining 22 cc. of the initial 30 cc. dose was injected. If by then the head was visible and the patient was judged to be ready for delivery, the caudal needle was removed and the patient was placed on the delivery table. If the patient was not ready for delivery, the continuous caudal analgesia apparatus was connected as described by Lundy.<sup>19</sup> Further doses of 20 cc. of the mety-  
caine solution were administered every 30 to 45 minutes according to the level of anesthesia as determined by pin-prick (the optimum level of anesthesia was at the umbilicus) and the patient's subjective complaint of returning pain. The average total amount of 1.5 percent metycaine administered to primiparas was 50 cc. and to multiparas, 46 cc. The average duration of the caudal analgesia, as measured from the time of the first injection of metycaine until



Figure 3.—Caudal roll (length 18 inches, diameter 6 inches).

<sup>19</sup> LUNDY, J. S.: Continuous caudal anesthesia in obstetrics. *S. Clin. North America* 25: 541-557, Aug. 1945.



*Figure 4—Patient on caudal roll.*

completion of the delivery (including any repair necessary), was 1 hour and 15 minutes for primiparas and 56 minutes for multiparas.

Careful check on maternal blood pressure and fetal heart rate was kept throughout labor. If there was a decided fall in blood pressure, 50 mg. of ephedrine was administered and the patient's lower extremities were raised for autotransfusion.

#### RESULTS

Of the 700 consecutive patients delivered, 320 were primiparas and 380 were multiparas. The average lengths of the various stages of labor were shorter than those given in the standard textbooks of obstetrics (table 1). Maintaining demerol and scopolamine analgesia closer to the time of delivery before administering the caudal analgesic resulted in 51 percent spontaneous deliveries (table 2) as compared to 39.2 percent spontaneous deliveries reported by Nicodemus et al.<sup>8</sup> In an effort to reduce the incidence of persistence occiput posterior presentation, 43.5 percent of the patients in this series were examined vaginally in order to determine accurately the position of the presenting part prior to administering the caudal analgesic. If anterior rotation had not occurred, the patient was given every opportunity to accomplish this prior to inducing caudal analgesia. In the

report of Nicodemus et al., 10.6 percent of the patients required forceps or manual rotations as compared to 6.3 percent in our series.

TABLE 1.—*Parity and average duration of labor*

	Number of patients <sup>1</sup>	First stage	Second stage	Third stage
Primiparas.....	320	9 hr 23 min	1 hr 30 min	23 min
Multiparas.....	380	5 hr 51 min	51 2 min	26 min
Total.....	700			

<sup>1</sup> Infants, 704 (4 sets of twins).

TABLE 2.—*Type of delivery and obstetrical operation*

	Number	Percent of total		Number	Percent of total
Spontaneous.....	359	51.0	Forceps rotation		
Low forceps.....	285	40.5	Posterior	9	1.3
Mid forceps.....	25	3.5	Transverse	6	.8
Persistent occiput posterior	46	6.5	Breech-fundal pressure	22	3.1
Deep transverse arrest.....	18	2.5	Breech extraction	5	.7
Manual rotation					
Posterior.....	35	5.0			
Transverse.....	12	1.7			

TABLE 3.—*Maternal complications*

	Number	Percent of total		Number	Percent of total
Infection (pyelitis, phlebitis, and endometritis)...	17	2.40	Required retention catheter	51	7.30
Maternal death.....	1	.14	Postpartum hemorrhage	9	1.28
Required catheterization.....	220	31.40	Fall in blood pressure requiring ephedrine	9	1.28

### COMPLICATIONS

The maternal complications that occurred in this series are noted in table 3. Despite the high incidence of vaginal examinations during labor, mild infection occurred in only 2.4 percent; this is not excessively high. Most of these manifested themselves as phlebitis or pyelitis; and there were no serious cases of endometritis. The single maternal death occurred in a patient who developed *phlegmasia alba dolens* and died suddenly at home 3 weeks postpartum. Although there was no postmortem examination, it seemed probable that the cause of death was pulmonary embolism.

The only annoying complication was postpartum urinary retention; 7.3 percent of the patients required a retention catheter for the relief of this condition. It was found that the incidence of this complication could be lowered by careful postpartum observation of the patient's bladder to insure that it did not become overdistended prior

to the return of the urge to void. Thirty-one and four-tenths percent of the patients required postpartum catheterization to prevent overdistension of their bladders.

The low incidence of postpartum hemorrhage (blood loss of 500 cc. or over) confirmed the observations of others of this advantage of delivery under caudal analgesia. Only 9 patients had a fall in blood pressure sufficient to require the administration of ephedrine and no maternal or fetal difficulty was attributable to these transient hypotensions.

There were no cases of postpartum headache, infections at the site of insertion of the caudal needle, neuropathies, or other maternal complications.

#### FETAL MORTALITY

One of the great advantages of conduction anesthesia for delivery is evident in the fact that 93.42 percent (table 4) of the infants cried spontaneously at birth. The fact that there were only 7 stillborns and 10 neonatal deaths was also remarkable. Two of the stillborns weighed less than 1,500 grams (table 5) and, therefore, were in the so-called previsible weight group. One of the stillborns was a macerated premature infant weighing 1,530 grams at birth, whose mother was admitted to the hospital with diabetic acidosis. The remaining 4 were full-term infants, one macerated and the other 3 dying during labor from undetermined causes.

TABLE 4—Condition of newborn infants

	Number	Percent of total
Awoke at birth	41	61
Spontaneous cry	854	82.4
Stillbirths	7	1.0
Neonatal deaths	10	1.4

TABLE 5—Stillborn infants

Term	4
Prematures (1,500–2,500 grams)	1
Previsible (less than 1,500 grams)	2
Congenital abnormalities	0
Total	7

Four of the ten neonatal deaths (table 6) were due to congenital abnormalities incompatible with life (two had congenital heart disease, one had spina bifida, and one had congenital cystic kidneys). One of the ten weighed 1,000 grams and would, therefore, fall in the previsible weight group. Five of the ten neonatal deaths were prema-

unable to cope with its ordinary tribulations. He claims that his life is an unusually hard one. In other words, he remains infantile in his reaction to his environment. He becomes morbid, introverted, and exceedingly interested in the interpretations of his own psyche. He shows a tendency to love the mystical, and continually rationalizes his motives.

Hyperthyroid patients show many disturbances of the sexual life. Frigidity in women is almost universal. There is fear of pregnancy and fear of childbirth combined with intense resentment and repressed aggression against men. The unmarried girls reveal psychosexual infantilism. In men, similar situations exist; degrees of sexual impotence or, at least, difficulties in sexual adjustment are always present.

All available evidence shows that the thyroid gland is not the primary organ affected, but that it is a link in the chain of circumstances between the so-called personality or constitution, on the one hand, and the expression of exophthalmic goiter on the other hand. Whether the mechanism is through the autonomic nervous system, or through the action of the endocrine organs, especially the thyroid and adrenal, is an unsettled problem but, in any case, it is an obvious fear reaction.

Every physician is aware of the functional changes that take place during fright, such as a rise in blood pressure, elevation of the basal metabolism, rapid pulse, pounding heart, increase in blood sugar, decrease in ascorbic acid excretion, cold sweat, gastrointestinal changes, and spasms of the stomach, colon, urinary bladder, and bronchi. Such functional disorders are as a rule evanescent, and cease when the insult has spent its force, but if the emotional insults continue over prolonged periods the functional reactions become more or less fixed, and the functional reaction becomes conditioned. The blood pressure, the basal metabolism, and the pulse rate remain elevated and the endocrine system must necessarily hypertrophy to keep up to the demand.

Our present knowledge of diabetes mellitus is such that we have not been able to bridge the gap between the growing volume of literature on personality and neurotic manifestations, on the one hand, and important physiological discoveries, on the other. Nevertheless, there are many cases which indicate the sudden appearance of diabetes associated with emotional stress. It has been definitely established that emotions do play a role in the fluctuation of the sugar level in cases of diabetes.

Obesity is very closely tied up with diabetes, and there is no doubt that obesity of all types indicates a disturbance in the caloric balance. More food calories are taken in than are utilized in the production

ture infants. The only full-term infant born alive who died and did not have a congenital abnormality definitely incompatible with life weighed 3,820 grams at birth and died 11 hours later. Autopsy revealed congenital atelectasis.

TABLE 6. *Neonatal deaths*

Term .....	4
Premature .....	5
Previable .....	1
Total .....	10

<sup>1</sup> 4 congenital abnormalities (3 term and 1 premature)

There were 41 premature infants weighing between 1,500 and 2,500 grams, an incidence of prematurity of 5.82 percent in this series. Thirty-five of these premature infants were born alive and survived and six of them were either stillborn or died neonatally, giving a gross fetal mortality rate of 14.63 percent. One of the six premature infants who failed to survive was the stillborn macerated infant born to the mother admitted with diabetic acidosis; another premature infant died of congenital cystic kidneys, previously mentioned, and the remaining four prematures died neonatally—one from cerebral hemorrhage and three from undetermined causes.

## RESULTS OF ANALGESIA

The same observer questioned each one of the 700 patients within 18 hours of their delivery. How the patient felt about the success of her analgesia is shown in table 7.

TABLE 7. *Results of analgesia*

Result	Primiparas		Multiparas	
	Number	Percent of total	Number	Percent of total
Precaudal				
Ideal	201	62.8	187	49.2
Good	50	15.6	63	16.6
Poor	52	16.4	50	21.6
Failure	10	3.1	40	10.5
Caudal				
Ideal	205	92.2	317	84.4
Good	5	1.5	6	1.5
Poor	8	2.5	17	3.4
Failure	12	3.7	41	11.6

*Precaudal analgesia.*—If the patient remembered nothing of her labor shortly after the first injection of demerol and scopolamine, the result was classed as ideal. If she remembered very little or believed that the injections relieved a great deal of her pain, the result was classed as good. If she admitted to little relief from her precaudal

analgesia, the result was classed as poor, and if she received no relief or time did not permit the precaudal analgesia to become effective, the result was classed as a failure. The main causes for the poor results and failures in this series were: (a) lack of time for the demerol and scopolamine to become effective because labor was too far advanced when the patient was admitted to the hospital or because of too rapid progress of labor; and (b) inexperience of the obstetrician in the correct timing of the administration of the drugs. The patients of the senior members of the group consistently reported better results than did those of the younger members.

*Caudal analgesia.*—If the patient received complete relief from pain shortly after administration of the caudal analgesia, the result was classed as ideal. If the patient recalled slight pain during delivery but the accoucheur believed the caudal analgesia was effective, the result was classed as good. If relief from pain was incomplete or one-sided as evidenced by the patient's reactions during labor but still no supplementary anesthesia was required for delivery, the result was classed as poor. If the caudal analgesia did not relieve the pain of uterine contractions or delivery or if for any reason caudal analgesia was not attempted, the result was classed as a failure. The most frequent cause of unsuccessful caudal analgesia (table 8) was insufficient time for its administration—often the patient entered the hospital ready for delivery or the progress of labor was misjudged. In only 12 cases was it impossible to insert the malleable needle into the caudal canal. Recognized bony abnormality of the sacrum was the cause of four of these failures and thick fat pads over the sacrum caused two. The cause of the other six failures was undetermined. In 28 patients, although the operator believed that the caudal needle was accurately placed in the caudal canal, satisfactory pain relief was not obtained and the reason for these unsuccessful caudal analgesias could not be determined.

TABLE 8—Reasons for unsuccessful caudal analgesia

Reason	Primiparas	Multiparas	Reason	Primiparas	Multiparas
No time	1	14	Adiposity over sacrum	2	0
Labor misjudged	0	13	Bony abnormality of sacrum	2	2
Unable to insert needle—cause unknown	2	4	Patient's request not to have caudal analgesia	0	1
Aspiration of blood	0	2	Labor failed to progress after inducing caudal analgesia	0	1
Aspiration of spinal fluid	1	0	Cause undetermined	11	17
Pilonidal cyst	0	1			

## SUMMARY

In 1945 the results of 500 deliveries under continuous caudal analgesia at the George F. Geisinger Memorial Hospital were reported



and it was concluded that labors were longer, occiput posteriors rotated less often, and operative deliveries were increased. As a follow-up, 700 consecutive vaginal deliveries occurring in the same closed staff institution from 1 July 1948 to 15 March 1949, were studied in an effort to discover what change had evolved in the management of labor to remedy the few handicaps of this method of analgesia.

In this series, demerol and scopolamine were used to induce analgesia in the first stage of labor, making it possible to administer caudal analgesia late in the first stage or in the second stage of labor. Labors were shorter, the incidence of forceps deliveries was reduced, and the incidence of persistent occiput posterior positions requiring rotation was reduced. Postpartum urinary retention requiring retention catheters in 7.3 percent of the patients was the most annoying maternal complication in this series. Maternal morbidity was low despite the high incidence of vaginal examinations during labor. The incidence of postpartum hemorrhage was unusually low. The single maternal death occurred at home 3 weeks postpartum and was probably due to a pulmonary embolus. Ninety-three percent of the infants cried spontaneously at birth. The gross still birth rate was 1 percent and the gross neonatal death rate was 1.4 percent, giving a gross or uncorrected fetal mortality rate of 2.4 percent.

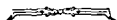
The incidence of premature births was 5.85 percent and the gross fetal mortality rate for premature infants was 14.63 percent.

Seventy-eight and five-tenths percent of the primiparas and 66 percent of the multiparas received ideal or good relief from the demerol and scopolamine analgesia. Caudal analgesia was successful in 94 percent of the primiparas and 85 percent of the multiparas.

### CONCLUSIONS

By the use of demerol and scopolamine analgesia in the first stage of labor, the caudal analgesic may be administered closer to the time of delivery resulting in: (a) shorter labors; (b) lower incidence of operative deliveries; and (c) lower incidence of persistent occiput posterior positions.

Demerol-scopolamine-caudal analgesia in the hands of a group clinic of trained obstetricians is a safe and effective method of inducing analgesia as evidenced by: (a) spontaneous crying at birth of 93 percent of the infants; (b) a gross or uncorrected fetal mortality rate of 2.4 percent; and (c) successful caudal analgesia in 89 percent of this series of 700 consecutive vaginal deliveries without maternal mortality or injury attributable to the analgesic.



in gastrointestinal operations has been a challenge to all general surgeons. Heavy bacterial implantation into surgically traumatized tissue throws an added handicap on the repair mechanism, which is now required not only to bridge the gap established, but also to eliminate the invading bacteria and their deleterious effects. Failure to obtain gastrointestinal sterilization has been a major deterrent in the progress of surgery in this field. Good technical performance has often met with defeat because of infection occurring in suture lines, mural abscess, resultant leakage, and peritonitis. This complication is still the most common single cause of failure in gastrointestinal operations. To meet this challenge several chemotherapeutic agents have been employed with gratifying results.

Prior to the availability of chemotherapeutic agents, preparation for intestinal operations was almost entirely dependent on starvation and elimination. These principles are still valid in that an empty bowel is usually at physiologic rest and has a significantly reduced bacterial content. *Enemas and mild cathartics, when indicated, remain initial steps in preparing the patient for operation.* Today although parenteral therapy is available for amelioration of starvation, intestinal antiseptics aid and implement mechanical cleansing.

The effectiveness of any agent used in bowel sterilization is dependent on several factors, namely (a) the antibacterial spectrum of the

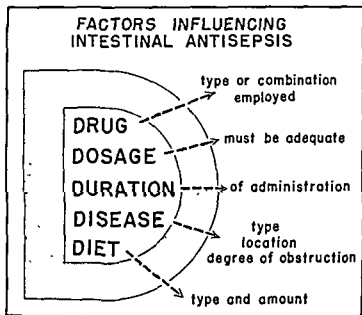


Figure 1.

drug, (b) the dosage employed, (c) the duration of its administration required for optimal bacteriostasis, (d) the rapidity of emergence of drug-fast bacteria, (e) the quantity of bacteria-laden food ingested, (f) the incidence of drug idiosyncrasy or toxicity, and (g) the presence of obstruction or nonsterilizable surfaces (fig 1).

Largely as the result of investigations by Poth<sup>3</sup> the nonabsorbable sulfonamides, sulfasuxidine and sulfathaladine, became accepted as effective drugs in establishing and maintaining a 99 percent elimination of susceptible fecal flora. Their advantages lay in their being poorly absorbed from the intestinal lumen and the low incidence of untoward effects. Although adequate doses of these agents may alter the aerobic flora for periods as long as 6 weeks, it was shown that these agents had no appreciable effect on enterococci, pseudomonas, or proteus organisms.<sup>4</sup> Since the advent of sulfonamide prophylaxis, procedures previously accomplished in two or more stages are now commonly replaced by single-stage primary anastomosis accompanied by a greater sense of security, and with commendable success.

Since 1945, Reimann et al.<sup>5</sup> and Zintel et al.<sup>6</sup> have shown streptomycin orally to be much more effective than sulfonamides against coliform bacteria and enterococci. This drug is nonirritating and, because it is not readily absorbed, is retained in the bowel in relatively high concentration. The coliform organisms are greatly reduced in 48 to 60 hours and suppression can be maintained for 5 to 8 days. Within this time, however, drug-resistant strains appear, causing the total bacterial count to rise to normal in the face of continued therapy. For this reason Lockwood et al.<sup>7</sup> warned that the preoperative use of this antibiotic alone may be dangerous because of the risk of a peritonitis caused by drug-resistant flora following operation. Preoperative oral administration of streptomycin for longer than 3 days is now considered injudicious. Poth et al.<sup>8</sup> and Lockwood showed that no synergistic action accrued when streptomycin was used in combination with sulfathaladine.

<sup>3</sup>POTH, E. J.: Sulfonamides as therapeutic agents in intestinal antisepsis, collective review. Internat. Abstr. Surg. 78: 373-380, 1944. In Surg. Gynec. & Obst. May 1944.

<sup>4</sup>FIROR, W. M.: Intestinal antisepsis with sulfonamides. Ann. Surg. 115: 829-832, May 1942.

<sup>5</sup>REIMANN, H. A.; ELIAS, W. F.; and PRICE, A. H.: Streptomycin for typhoid, pharmacologic study. J. A. M. A. 128: 175-180, May 19, 1945.

<sup>6</sup>ZINTEL, H. A.; WILEY, M.; NICHOLS, A. C.; and RHODES, J. E.: Use of streptomycin

The superiority of streptomycin in effecting rapid reduction of the fecal bacterial count stimulated search for a supplemental agent to block emergence of dangerous drug-resistant bacteria. Pectin compounds give subjective relief in patients with various diarrheas. This effect is believed to be caused by the metabolism and the liberation of a uronic acid radical. Metallic pectinates have been shown to be bacteriostatic independent of their low pH values.<sup>9</sup> Streptomycin, when used in combination with aluminum pectinate, has proved to be more effective in the suppression of bacterial flora than when used alone. Not only are the coliform organisms rapidly reduced in numbers, but gram-positive organisms such as the hemolytic streptococcus and clostridia are also suppressed. Experience has demonstrated, however, that the large doses of pectinate required to accomplish this may result in a feeling of fullness and bloating. Moreover, at operation the intestine contains much gelatinous residuum, a condition less desirable than a flat, empty bowel.

Glucurono-lactone, a derivative of glucuronic acid, has been shown to be more effective than the pectin compounds when employed with streptomycin for this purpose.<sup>10</sup> Glucuronic acid is conjugated in the liver and is considered to be the principal agent by which various drugs are detoxified. The combination of streptomycin and glucurono-lactone employed is not accompanied by undesirable side effects and produces pronounced suppression of predominating bacteria in 48 to 60 hours. Fecal antisepsis may be maintained for comparatively long periods. On discontinuing the drug, a normal flora does not reappear before 48 hours. Furthermore, streptomycin-resistant strains do not seem to predominate in this new growth.

The newer antibiotics, aureomycin and chloramphenicol, exert an effect on intestinal bacteria intermediate between that of the sulfonamides and streptomycin. In contrast both are readily absorbed. Aureomycin by mouth has been advocated for the surgical preparation of the bowel by several authorities. A recent publication of the Mayo Clinic<sup>11</sup> concludes: "Aureomycin is the most effective substance we have found for removing bacteria from the intestinal tract of man." Pulaski<sup>10</sup> in a prior study demonstrated that although significant reduction in the flora did occur, it was "of lesser magnitude than

<sup>9</sup> WUNDERLICH, W. E. and MAST, G. W. Effects of uronic acids; pectins and pectinates on the enteric flora, alone and in combination with antibiotics; in vitro studies. *Am. J. Surg.* 78: 581-586 Dec 1949.

<sup>10</sup> PULASKI, E. J. and CONNELL, J. F., JR. Control of peritoneal infection in gastrointestinal surgery. *Bull. U. S. Army M. Dept.* 9: 265-270, Apr 1949.

<sup>11</sup> DEARING, W. H. and HEILMAN, F. R. The effect of aureomycin on the bacterial flora of the intestinal tract of man—a contribution to preoperative preparation. *Proc. Staff Meet., Mayo Clin.* 25: 87-102, Feb 15, 1950.

that obtained from sulfonamides or streptomycin" and therefore of questionable value. Subsequently, Meager and Shaper<sup>2</sup> duplicated this work and obtained results "in close agreement with those of Polakid." They further demonstrated that with aureomycin a definite overgrowth of proteus organisms occurred, consistent with the coliform suppression to such an extent that "the total gram-negative count in the weighed stool far exceeded the normal count." Aureomycin, therefore, still has to be proved a superior agent in the establishment and maintenance of intestinal antiseptics. In addition, it is expensive.

Chloramphenicol, like aureomycin, causes *E. coli* to disappear gradually. The total bacterial count falls and then rises, with *E. coli* as the predominant organism. After initial suppression has terminated, the bacterial counts tend to rise above pretreatment levels and remain high, decreasing only after the drug has been discontinued. It, therefore, possesses no unique features as a preoperative intestinal antiseptic. Like aureomycin presently, it is a comparatively expensive drug.

The action of polymixin is qualitatively similar to that of streptomycin, except that drug fastness apparently does not occur and proteus and gram-positive organisms are unaffected. Likewise, it is not absorbed from the gastrointestinal tract. Further evaluation of this drug is necessary. At present, polymixin is commercially unavailable.

No single drug or combination of drugs may be considered ideal. Each has appreciable effectiveness; each its limitations. From initial laboratory evaluation and clinical experience two types of drugs appear to be superior to others: (a) The non-absorbable sulfonamides in doses of 0.1 to 0.25 gram per kilogram of body weight for 5 days are reasonably effective if it is possible to postpone operation for that length of time. They are also economical and usually readily available; (b) our experience with now well over 100 patients, has demonstrated the superiority of 2 grams of streptomycin and 4 grams of gluconolactone daily for this purpose. This combination more effectively reduces the total intestinal bacterial count, does it quicker, maintains suppression for comparatively long periods, and is not handicapped by the development of a drug-resistant flora.

In preparing a patient for elective gastrointestinal surgery, it is essential for the maximal effect of any drug that the tract be cleaned of its contents and maintained that way. This implies cathartics

<sup>2</sup>MEAGER, W. L. and SHAPER, S. Evaluation of oral streptomycin for intestinal antiseptics. J. Surg. Res. 1: 4-11, Feb. 1956.

and/or enemas until the bowel is emptied and permitting nothing but liquids by mouth in this period of management. This allows for mass reduction in bacterial content and maximal contact between the agent and remaining micro-organisms.

In preparing for an emergency operation in a patient with luminal or vascular obstruction or perforation from any cause such a leisurely approach is not permissible. Decompression is urgently needed to prevent further spread of infection and to combat the associated ileus. Early surgical repair or exteriorization is mandatory, with parenteral antibiotics as one supportative measure. The use of antibiotics by the oral route in these patients or following an elective operation which has become complicated by peritonitis, is ineffectual. Polybacterial peritoneal soilage may be extensive. The immediate establishment of a high antibiotic blood level, and, therefore, peritoneal exudate level, is a surer means of inhibiting further bacterial invasion or multiplication. Scientific proof is lacking in support of the value of sulfonamides or antibiotics placed in the peritoneal cavity. Shock, dehydration, secondary anemia, hypoproteinemia, and electrolyte disturbance receive proper daily attention. The gastrointestinal tract must be placed at rest and so maintained until all points of leakage have sealed, and the peritoneal soilage is being adequately managed by the natural defenses of the body. This is usually signaled by return of peristalsis, normal pulse, reduction of fever, passage of gas or feces voluntarily, and reduced abdominal rigidity and sensitivity. Parenteral antibiotics are continued until these signs are evident for at least 48 hours.

The lethal organisms in peritonitis are gram positive. The antibiotic most effectively employed against these organisms is penicillin, but since it is readily inactivated by penicillinase, which is elaborated by fecal gram-negative organisms, the use of penicillin alone in mixed infections is inadequate. Streptomycin with its known specificity for combating the gram-negative organisms, when parenterally administered with penicillin, may be expected to give adequate coverage in these cases. In severe peritoneal infections, the addition of parenterally administered sulfadiazine may be desirable for synergistic effects.

Recently parenteral aureomycin has been demonstrated to be of real value in combating secondary peritonitis. Wright et al.<sup>12</sup> reporting on aureomycin treatment of a series of 52 consecutive patients with peritonitis secondary to perforated peptic ulcer, appendicitis, and diverticulitis, with a mortality of only 4 percent, concluded that this drug is of significant value. Certainly with increased availability,

<sup>12</sup> WRIGHT I. T. et al. Treatment of acute peritonitis with aureomycin. *Am. J. Surg.* 78: 17-22, July 1949.

aureomycin deserves serious consideration in combating this complication. Further experience is necessary to establish its position in our armamentarium. Aureomycin-glycinate in doses of 500 mg. with 1,000,000 units of penicillin G given intravenously every 12 hours in 1,000 cc. of physiologic saline solution has given gratifying results in fulminating infections in our 6-month test period. The most singly effective agent to date in our hands is terramycin, of which we administer 1 gram intravenously every 12 hours.







of energy. In the study of obese patients it is very evident that a number of motives for excess eating, beyond that of appetite is evident. The most common motive is an inner feeling of emotional emptiness, a boundless void which eating will temporarily, but never completely, alleviate. Overeating may be a physiological attempt *to compensate for lack of love and security in the early years, and is more a craving than an appetite.* This compensatory drive may also become confused with the reproductive instinct through the childhood fantasies of oral eroticism.

#### ACHES AND PAINS

The patient who complains of aches and pains in the muscles and joints is frequently seen in general practice. He may also complain of chronic fatigue and a slight fever. These cases may be diagnosed as tuberculosis, rheumatism, and, recently, chronic brucellosis has become a frequent diagnosis. Usually these patients are treated by rest and more rest, and continued restriction of their life activity.

An investigation of the history of these patients will usually bring out the fact that they are poor sleepers, their sleep is disturbed by dreams, they have marital problems, and they have made a poor sexual adjustment. Significant emotional conflicts may be found which are apparently responsible for the fatigue. But the special feature associated with muscular aches and pains is the presence of chronic resentment, of which the patient is usually totally unaware. The muscles serve as a means of defense and attack in the struggle for existence, and thus the internal tension is most easily relieved by muscular action. When the external expression of aggression in the form of muscular action is inhibited, then muscular tension may result, which is felt by the individual as pain and limitation of movement. This often is interpreted by the physician as a fibrositis, or muscular rheumatism.

In chronic orthopedic conditions the question will always arise as to why the patient came at just that particular time to the physician. It will frequently be found that the patient's threshold of discomfort has been lowered by some alteration in the working conditions or by a shift in the family relations, setting up an altered emotional state. Understanding the problem and fitting the circumstances to the individual often make surgery unnecessary. Sometimes a patient makes a regression to infantile states, or there may be unwillingness to recover, because of the advantages of a secondary gain. Also, there may be an unconscious wish for punishment. These individuals are frequently accident-prone.

# The Superior Vena Caval Syndrome

## Report of Two Cases

G. MARION KAHN, *Commander, MC, U. S. N.*<sup>1</sup>

**I**N THE past 3 years two cases of the superior vena caval syndrome have been observed by the author. Both of these were a result of new growths and the patients were seen too late for remedial measures to be successful.

Unfortunately facilities were not available to do diodrast studies, and bronchoscopic examinations were not made because the first patient was too seriously ill and the second patient failed to stay in the hospital for this procedure. However, autopsies performed on both patients confirmed the clinical impression of new growths with invasion of the superior vena cava.

In a comprehensive survey of the literature in 1949, McIntire and Sykes<sup>2</sup> studied all cases reported from 1901 up to and including January 1946. They found 250 authentic cases and added 2 more of their own. They stated that Fischer<sup>3</sup> had collected 252 cases of this syndrome prior to 1901.

The incidence, anatomic and physiologic considerations, etiology, symptoms, treatment, prognosis, and historical data are most adequately covered in the articles by McIntire and Sykes and by Hussey et al.<sup>4</sup>

A search of the literature available at this hospital and in this area has failed to reveal any additional published articles dealing with the superior vena caval syndrome between 1946 and May of 1950.

<sup>1</sup> U. S. Naval Hospital, San Diego, Calif.

<sup>2</sup> MCINTIRE, P. T., and SYKES, L. M., JR.: Obstruction of superior vena cava; review of literature and report of two personal cases. *Ann. Int. Med.* 30: 925-960, May 1949.

<sup>3</sup> FISCHER, J.: Über Verengernug und Verschliessung der Vena cava superior. *Innuz Dissert.* Halle, 1901. Cited in <sup>2</sup>

<sup>4</sup> HUSSEY, H. H.; KATZ, S., and YATTE, W. M.: Superior vena caval syndrome; report of 35 cases. *Am Heart J.* 31: 1-26, Jan. 1946.

## CASE REPORTS

CASE 1. A 67-year-old white man was admitted to the U. S. Naval Hospital, San Diego, Calif., on 11 December 1947 complaining of shortness of breath for 4 years, cough for 2 years, chest pain and orthopnea for 4 months, swollen arms and face for 2 months, enlarged veins of chest and abdomen for 6 weeks, loss of appetite for several months, and hemoptysis for 2 weeks. A review of former admissions revealed (1) that in 1945 he was believed to have cardiac asthma and he had roentgenographic evidence of distinct passive congestion for which he was treated with iodides and sulfonamides; and (2) that in 1946 when roentgenograms of the chest were essentially negative (fig. 1) but he was complaining of shortness of breath and difficulty in breathing when lying down he was believed to have bronchitis and discharged after a short stay in the hospital.

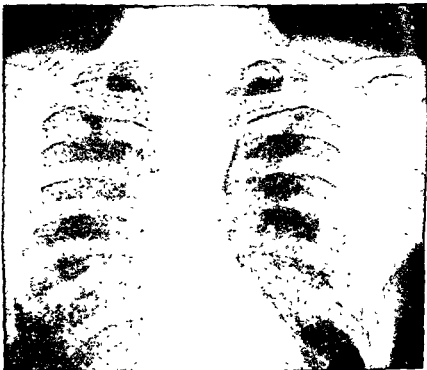


Figure 1.—Case 1. Roentgenogram taken 15 October 1946.

The physical examination on this admission revealed an elderly white male with moderate cyanosis who appeared to be in acute distress. He was unable to breathe except when in the upright position. There was minimal cervical and inguinal adenopathy with marked bilateral axillary adenopathy, and an extensive network of distended

veins over the thorax and abdomen; the arms were edematous. There was increased dullness to percussion to the right and left of the sternum, dullness in both bases with a few sibilant rales, and a fluid mass was palpable just below the xiphoid cartilage.

*Laboratory data.*—The urinalysis was negative; sedimentation rate, 25 (Cutler); hemogram, normal; blood Kahn test, negative; serum proteins, 6.2 grams with A/G ratio of 1/1. The electrocardiogram was normal. Roentgenograms of the chest (figs 2 and 3) revealed widening of the upper mediastinum; it was irregular along the right border and there was a moderate amount of fluid in the right pleural cavity and a suggestion of some fluid in the left base. There was moderate aortic calcification.

Indirect laryngoscopy revealed paralysis of the interarytenoid muscle.

*Venous pressures and decholin studies.*—(a) Patient was almost upright; (b) decholin time, 26 seconds; (c) venous pressure, 300 mm. water; (d) no essential change in venous pressure on deep inspiration

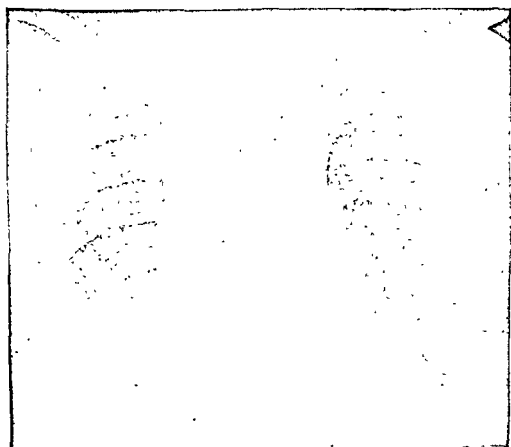
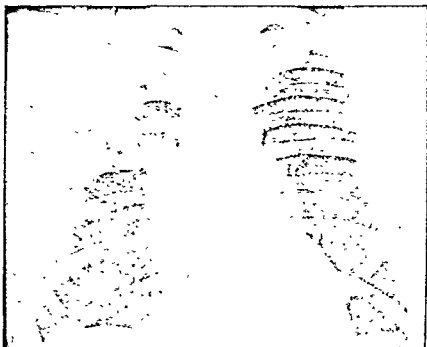


Figure 2.—Case 1. Roentgenogram taken 20 December 1947, 14 months following the first roentgenogram. This and figure 3 show the widening of the mediastinum.

this area into the right apex and a slight increase in the bronchovascular markings radiating downward from this region.

The vital capacity was 3.21 against a normal of 4.90 liters. Specimens of sputum stained by Papanicolaou technic were negative for malignant cells. Gastrointestinal barium study was negative. Laryngoscopic examination was negative. Barium enema was negative. Fluoroscopic examination of the chest revealed both diaphragms to



*Figure 4—Case 2. First roentgenogram of chest taken 19 September 1949 revealing the infiltration extending up into the right apex.*

more freely. The electroencephalogram was normal. An infra-red photograph of the chest (fig 6) showed dilated veins in the upper chest. Cystoscopic and retrograde urinary tract studies were negative.

A roentgenogram of the chest taken 5 weeks after the first one revealed a slight increase in the infiltration in the upper right lung field and it was noted that there was a small patch at the periphery of the left lung opposite the second interspace anteriorly.

The patient was digitalized and preparations were made to perform a bronchoscopy, however he insisted on leaving the hospital against medical advice. At the time of discharge the pulse was 84, the chest was hyperresonant with coarse moist rales in the right base, the liver was 3 fingerbreadths below the costal margin, there was

clubbing of the fingers, and 4 plus pitting edema of the legs up to the knees.

Approximately 4 weeks after discharge he was readmitted complaining of shortness of breath and edema of the upper extremities. The physical examination revealed an acutely ill white male who was extremely dyspneic and cyanotic. The blood pressure was 100/60; the heart was enlarged to percussion 2 cm. outside the midclavicular

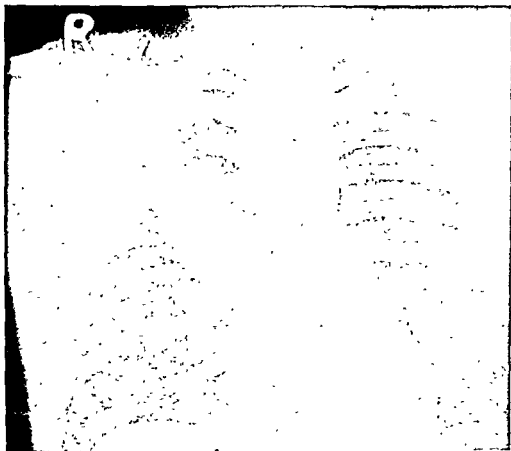


Figure 5.—Case 2. Roentgenogram taken 10 October 1949, 21 days after figure 4, showing increase in density extending into right apex.

line in the fifth interspace, there was marked dullness with decreased breath sounds and vocal fremitus over the lower one-third of the right lung, the liver was palpable 2 fingerbreadths below the costal margin, there was slight nonpitting edema of both legs, and 3 plus pitting edema of both upper extremities. A roentgenogram taken just prior to death showed the right pleural cavity almost completely filled with fluid. Despite all supportive measures he died 24 hours after admission.

*Postmortem findings.*—There was replacement of the intercostal muscle in the fifth intercostal space by necrotic pink tumor with ero-

## PRINCIPLE 4

A removable partial denture should not injure remaining teeth or adjacent structures. It is essential to plan or design the restoration in accordance with biologic laws governing the reactions of tissue. Sound principles of mechanics must also be followed in order that the appliance will function without undue alteration. The appliance must be carefully made so that it will go into its place without modification of the adjacent structures. The casts used in making removable partial dentures must be made from impressions which faithfully record the shape of the oral tissues.

The functions of a removable partial denture are: (a) the restoration and preservation of occlusion impaired by loss of teeth; (b) the restoration and preservation of occlusion impaired by malposition of remaining teeth; (c) the preservation of the remaining teeth and alveolar ridges; and (d) the restoration of a normal or desirable facial expression impaired by loss of teeth or closure of the bite. A removable partial denture must be planned and constructed to fulfill these essential purposes with a minimum of interference with the tongue or enunciation and the least possible display of structural materials. The various parts of the base must be designed to provide an adequate mechanical counterbalance or resistance to the differently directed forces or movements without interfering with any of the functions of a removable partial denture.

Saddles are supporting elements, one of their functions being to resist vertical masticatory pressure against the alveolar ridges. These flanges, resting against the lingual or labial sides of alveolar ridges, may provide bracing support against horizontal, lateral, or anteroposterior displacements. The stress of mastication must be resisted by an adequate support. When possible, toothborne support should be used, otherwise the size of the saddle must be increased in proportion to the stress exerted on it. When the size of the saddle cannot be increased sufficiently, the occlusal stress must be reduced in order that a satisfactory relation between pressure exerted and ability to resist such pressure is attained.

Removable partial dentures which depend on mucosa for support must not transmit this stress other than in a rootwise vertical direction to the abutment teeth. When the denture is displaced because of compression forces occasioned by the stress of mastication, torquing strain must not be transmitted into the abutment teeth. These strains and stresses must either be minimized or eliminated by proper design of the retainer or some sort of stress-breaking action must be provided. Clasps are direct retainers whose function is to prevent the vertical dislodgment of the denture from its seat. Clasps may also serve as

bracing supports to prevent the horizontal shifting of the denture or drifting or rotation of the teeth engaged by them. Direct retention by clasps is provided only for the ends of the saddles to which they are attached. When no anchor teeth are available at the other end, some means must be found to hold the saddles in their position against the ridges. This can be accomplished by extensions of the base to rest against the surfaces of teeth on the opposite side of an axial line between the clasps. Such parts of a denture are known as indirect retainers.

Indirect retention as well as direct retention should be provided in all patients with distal extension in order to stabilize the appliance. Major connectors, such as palatal, lingual, or labial bars, serve the purpose of joining posterior saddles with each other, or in unilateral cases connecting the posterior saddle with an anchorage on the side of the arch opposite the saddle. Among these connecting elements must be included all the smaller bars and struts that are employed to join nearby saddles, or to support or reinforce clasps or indirect retainers. Lingual and palatal bars should be so located that they will neither interfere with the comfort nor the speech of the patient. The palatal bar should be located in about the same position as the distal border of a complete denture, crossing the palate distal to the second molars.

Independent lateral action of saddles should be prevented. The use of too light a lingual or palatal bar allows an independent action of saddles, rotating about the ridge crest as a center. The stress of mastication in causing this rotation places great pressure on the buccal and lingual peripheries of the saddle. Soreness in these areas may result and the dentist frequently is forced to trim away the saddle thus reducing the much needed support. Bars joining saddles, and lingual bars in particular, must be of sufficient strength to prevent torsion of saddles. Stabilization is not merely a matter of vertical support and vertical retention. It is a problem of anchoring a denture to prevent displacement from its functional position by forces that act on it horizontally as well as vertically.

Tooth rests, sometimes called "stops" or "rest lugs," are intended to resist the movement of a denture by vertical masticatory pressure. In addition to vertical support of the denture in its functional position, they also (a) are an important aid to the retentive capacity of clasps, by helping to keep the clasp terminals in their proper positions; (b) prevent impingement of the cervical edges of clasps against the gingival margins of anchor teeth; and (c) prevent the impingement of the extremities of saddles against tissues adjacent to the gingival margins.



Each tooth adjacent to an edentulous area should carry a tooth rest, whether it is clasped or not. As direct retainers, clasps secure against vertical displacement those parts of dentures to which they are directly attached, and depend for their effectiveness on (a) the contours of the crowns of the anchor teeth, or the angles at which they lean toward or away from each other, and (b) the physical properties of the clasp metal. In order to provide retention, one or both of the terminals or arms of a clasp must be elastic enough to spread open and pass the opposing projections created by the contours of the anchor teeth and then close about the undercut. This spreading is greatest at the free ends or terminals and gradually diminishes to nothing where the clasp is joined to the base of the denture. To locate these undercuts and determine the most favorable areas for retention, the master cast should be surveyed. Clasp guide lines should be charted with a surveying instrument. The guide line defines the limits of projection on the contour of the proposed anchor teeth and indicates the position of retention undercuts. The position of the guide line and, therefore, of the clasps can be changed by varying the angle at which the cast is tilted. The angle of the cast determines the path of insertion of the denture to make it easy to seat and remove from the mouth, in a direction parallel to the vertical mandrel of the surveyor.

#### PRINCIPLE 5

A removable partial denture is a form of treatment rather than a cure. As with any other treatment, it should be planned in accordance with the conditions of the particular case, it should be individualized and must be modified from time to time in order to suit changing conditions. The denture itself is subject to wear and breakage. The oral tissues never remain the same but are constantly changing, hence the patient must be periodically recalled in order to prevent or rectify deleterious changes that may take place. In the construction of a removable partial denture, simplicity should be a byword. The simpler the appliance, the less need for adjustments and repair. The appliance should be so designed and constructed that it may be modified to compensate for changes in the thickness of mucosa or alveolar resorption.

#### CONCLUSIONS

The planning and designing of a removable partial denture is a responsibility of the dentist and should not be delegated to any other person. The dentist engaged in making such restorations must have a knowledge of the biologic and mechanical factors involved and he must continuously augment this knowledge. This type of prosthesis is treatment and should be planned in accordance with the conditions peculiar to the patient. This requires more than a knowledge of

mechanical factors and technical ability. Plan, design, and then construct to obtain the best results. The principles of surveying, the significance of the guide line, its relation to the clasp, and the opportunity presented by tilting the model to control the location of undercuts are basic factors that enable the dentist to solve any problem in this field.



human breast feeding remains very high, close to 100 percent. These mothers nurse because they know the infant deprived of human milk during the first year has a poorer chance of survival.

1. Human breast milk feeding:

- (a) Clean source.
- (b) Adequacy (C-P-F-minerals, vitamins, and so forth).
- (c) Digestibility.
- (d) Colostrum (its value in relationship to immunity transmitted).
- (e) Emotional (mother-infant relationship).
- (f) Contraindications.

There is no question of the clean source. It has been stated repeatedly that human breast milk is kept at the correct temperature, stored in a readily available place, and for all practical purposes is free of harmful bacteria.

We know of the adequacy of breast milk as to the content of carbohydrate, protein, fat, minerals, and vitamins. These percentages are quite constant in breast milk with the exception of fat. The carbohydrate is lactose 7 percent, protein 1-1.5 percent, fat about 4 percent but may vary from 2 to 10 percent, minerals 0.25 percent, and water the remaining 87 percent plus. Fifty years ago, the human milk was described in less than a dozen components. Macy<sup>4</sup> recently reported the results from analyses of samples of breast milk for each of 73 components in colostrum, transitional milk, and mature milk. This additional information emphasizes the adequacy of breast milk.

Recent studies indicate that premature infants have a low tolerance for fat and thrive better on a low fat feeding.<sup>5,6</sup> The fat content is very low in colostrum, increases in the transitional human milk during the first month, and often does not reach its highest level in mature milk until 30 or more days after birth. The first part of breast milk obtained by premature and small infants, who do not suck vigorously, has a low fat content. As a result, they do not obtain the high fat content of the strippings or last part of milk. Thus nature has provided adequate milk for the premature as well as the full-term newborn infant. It is wise, however, to give a premature infant the breast milk pumped from its own mother. In this way, the fat content will be increased gradually, thus offering the best chance of tolerance.

<sup>4</sup>Macy, I. G. Composition of human colostrum and milk. *Am J Dis Child* 78: 559-603 Oct. 1949.

<sup>5</sup>Gordon, H. H. Feeding of premature infants. *Am J Dis Child* 73: 717-718 June 1947.

<sup>6</sup>Gordon, H. H. and Levine, S. Z. Metabolic basis for individualized feeding of infants, premature and full term. *J Pediatr* 25: 464-475 Dec. 1944.

## GASTROINTESTINAL TRACT

... by blanching. Analogous changes occur in the nose, the bowel, the bladder, and the vagina. Everyone is aware of the effect of emotions on the blood supply to the penis. Under emotional stress the temperature in the fingers and toes may drop as much as 35° F. The reduction in the renal blood flow may be as much as 40 percent under such conditions.

The emotional elements in peptic ulcer are well known. Every ulcer patient has noted recurrence of ulcer activity with the appearance of tension. The peptic ulcer conflict develops from an unconscious longing for a dependent relationship and a reactive striving for asserting independence. Again, in these patients, the conflict begins in early childhood. The child seeks security by striving to meet rigid exacting standards set up by the early authoritative figure, such as the parent or teacher, while at the same time anticipating failure because of a strong feeling of inadequacy. To allay this fear of failing or losing security the child struggles to perform precisely in the manner he feels is expected of him.

As the person grows up, he continues to utilize the same pattern in seeking security, but new circumstances in his life engender further conflicts. At adolescence strong investigative and creative urges emerge, which he feels have to be suppressed. Unconsciously he still harbors a compelling fear that his security is threatened if he pursues any but the goals that have been set for him. This is the source of conflict. Resentment inevitably accompanies the need to deny and reject his own inclinations and fancies. In addition the demands of society, representing security to him, appear to become more elusive and unobtainable than they were in childhood. Thus, tension develops in his pursuit of security. The striking feature of the ulcer patient when he is caught up in such a conflict is that he either physically tries to do what he feels is impossible or mentally wrestles with countless possibilities in an endeavor to discover the proper solution. The ulcer patient never gives up trying to accomplish his set task. Frequently he continues until his ulcer symptoms remove him from the conflict situation.

The emotions of resentment, anger, and anxiety are found to be associated with hypersecretion of acid and pepsin, hypermotility, hyperemia, and increased mucin elaboration; fear and resentment may cause a definite decrease in the secretion of mucin. Other evidences of autonomic nervous system imbalance, such as excessive palmar sweating, tachycardia, bradycardia, urinary frequency, spastic colitis, and

Infantile eczema has been shown to occur less frequently in the breast-fed infant.<sup>7</sup> The incidence is doubled in the partially breast fed and increases seven times in the entirely artificially fed infant. Breast milk appears to be a great factor in the prevention of allergy in infants and children. Morbidity and mortality rates are lower in the breast-fed than in the artificially fed infants.<sup>8</sup> This is most striking in the lower incidence of respiratory infections occurring during the second half of the first year of life.<sup>9</sup> Gastrointestinal infections are also less frequent in the breast-fed infant.<sup>10</sup> Breast milk appears adequate in the prevention of illnesses as well as from the nutritional standpoint.<sup>11 12</sup>

Breast milk is easily digested by the newborn infant. It remains nearly liquid in the stomach and forms curds which are soft, finely flocculent, and permeable to digestive juices.

Colostrum is present in the mother's breast during the latter months of pregnancy and the first 3 or 4 days following delivery. It is much thicker than later breast milk, lemon yellow in color, and has a specific gravity between 1.050 and 1.060 in contrast to a specific gravity of around 1.030 in breast milk. Several ounces of colostrum are obtained daily by the nursing infant. Colostrum varies widely in composition but in general has about five or six times as much protein, twice as much mineral salts, and about half as much fat and carbohydrate as later milk. It has a high sodium and phosphorus content. In contrast to breast milk, colostrum coagulates on boiling. Colostrum has the important function of being a laxative and for this reason may be of importance in ridding the intestinal tract of meconium. Animal experimentation has led to the theory that colostrum may be of significance in the development of immunity in the infant.<sup>13</sup>

The emotional factor is important. The mother-infant relationship cannot be stressed too strongly. After the birth of a newborn

<sup>7</sup> GRULEE, C. G., and SANFORD, H. N.: Influence of breast and artificial feeding on infantile eczema. *J. Pediat.* 91:223-235, Aug. 1956.

<sup>8</sup> GRULEE, C. G.; SANFORD, H. N.; and HILSON, P. H.: Breast and artificial feeding; influence on morbidity and mortality on 20,000 infants. *J. A. M. A.* 103: 735-739, Sept. 8, 1934.

<sup>9</sup> STEVENSON, S. S.: Adequacy of artificial feeding in infancy. *J. Pediat.* 31: 616-630, Dec. 1947.

<sup>10</sup> LUNS, J. H., and MULLIGAN, P.: Incidence and mortality of breast and artificially fed infants admitted to hospital with infections. *Arch. Dis. Childhood* 17: 217-219, Dec. 1942.

<sup>11</sup> POTTEK, E. L.: Lessons to be learned from study of infant deaths. *J. A. M. A.* 124: 356-359, Feb. 5, 1944.

<sup>12</sup> ALPERICH, C. A.: Advisability of breast feeding; survey of Subcommittee of Committee on Maternal and Child Feeding. National Research Council. *J. A. M. A.* 135: 915-919, Dec. 6, 1947.

<sup>13</sup> BRENNEMANN, J.: *Practice of Pediatrics*, vol. 1. W. F. Prior Co., Hagerstown, Md., 1948. Chapter 23, pp. 1-4.

infant, its closest contact with the mother comes during the period when it is being nursed. At birth the infant has to maintain its body temperature, initiate respiration, and take on many functions which before were carried on for it by the mother. By nursing the infant, the mother continues to be the source of supply. The only difference is that the nourishment is now obtained through his gastrointestinal tract whereas prior to birth he was nourished through the maternal blood supply. The physical act of nursing is an excellent opportunity for the mother to give the newborn infant security. It should be a time of happiness for both mother and infant. The mother should derive great satisfaction from the giving of herself to her infant and show love and affection during the act of nursing. How often we notice this in the gentle stroking of the infant's face, body, or hands by the mother during the nursing act. The separation of the infant from the mother should be a gradual process.

*Contraindications of breast feeding.*

- (a) Complete absence of milk (a very rare condition).
- (b) Maternal whooping cough at the time of delivery.
- (c) Open active maternal tuberculosis.
- (d) Intractable inverted nipples that render nursing impossible.
- (e) Painful nursing that the mother cannot bear.
- (f) Emotionally immature mother who abhors any physical contact with the baby's lips to her breast and speaks of the nursing act as being repulsive. Of course, this is evidence of rejection of the baby before or at birth. These infants must be artificially fed in order to give them the best possible chance to obtain security through the gratification of their appetite and to be nourished. They rarely derive this security or gratification from attempting to nurse such a mother unless such a mother is shown the light, so to speak, and enters into the nursing act wholeheartedly. If and when such a mother cannot be persuaded to nurse the infant for the security that she will transmit to her off-spring, as well as for the nourishment obtained, it is quite likely that she will shirk other responsibilities of a mother. The chances are great for such an infant to develop symptoms of insecurity from rejection. Later these infants are prone to develop nightmares, speech defects, enuresis, thumb and finger sucking habits from their lack of security obtained from the mother. These conditions are far more serious than the nutritional loss from not receiving their mother's milk.

Rh negative mothers who possess anti Rh agglutinins in their blood also have these agglutinins in their breast milk.<sup>12</sup> This was at one time

considered a contraindication to breast feeding until Cathie<sup>14</sup> demonstrated no effect (anemia, jaundice, or edema) when breast milk containing anti Rh agglutinins or high titer human serum was fed Rh positive infants. Breast feeding of erythroblastotic infants is practiced routinely at the hospital for sick children. Rh incompatibility is not considered a contraindication to breast feeding.

An opportunity to institute breast feeding in a large number of newborns presented itself to me in 1943 at the United States Naval Dispensary in Washington, D. C. Because of frequent changes in medical personnel, the babies delivered by the obstetrical staff were not examined by pediatricians, and the mothers were given formulas by the interns or nurses at their time of dismissal from the various hospitals. As a result, practically every infant brought to the dispensary at from 4 to 6 weeks of age was artificially fed.

Close cooperation between the obstetrical and pediatric departments resulted in the formulation of plans whereby the newborn infants were turned over to the pediatric service at birth. These newborn infants were examined usually within the first 24 hours. They were put to breast at the first regular feeding time after they were 12 hours old and allowed to nurse for 5 minutes at each breast 3 three times a day until the third day when a 4-hour nursing schedule was instituted day and night, the infant being allowed to nurse one breast at a feeding as long as it desired. Five percent glucose water was offered every 4 hours until lactation was established, then boiled water was offered after breast feedings. If an infant took more than an ounce of water after each feeding, a complementary formula was offered.

Every mother was visited after the examination of her infant and told of its state of health. She was asked to try to breast feed her baby, being assured that a formula would be given her upon dismissal from the hospital which she could use if it became necessary. Each mother was asked to continue breast feeding for the first month, even though a complementary feeding was necessary to satisfy the infant's appetite. Mothers were told that the infant's best first food was breast milk and that other foods, as well as milk other than breast milk, would be given to her baby at a later date as the infant showed the need.

Future nutritional requirements of the infant and mother were anticipated both while in the hospital and at later visits to the dispensary. The mothers were acquainted with the fact that one could not rely upon breast feeding alone beyond the fourth month and that continuing breast feeding beyond the seventh month was probably not

<sup>14</sup> CATHIE, I. A. B.: Breast-feeding in erythroblastosis fetalis. *Brit. M. J.* 2: 650, Oct. 25, 1947.

Factors influencing the mother to breast feed or not to breast feed may be described as (a) heredity and (b) environment. Because the ability to nurse is often considered to be transmitted from mother to daughter, heredity is believed to be an important factor. If the maternal and paternal grandmothers successfully breast fed the mother and father of the prospective newborn, breast feeding is much more likely to be successful; and also to be anticipated. Environment may be described as

(a) The attitude of the husband, friends, and relatives of the mother before parturition and after her return home from the hospital.

(b) The obstetrician who exerts the first and most important medical influence on the pregnant mother in preparing her emotionally and physically to breast feed her offspring. Breast feeding should be strongly advocated at the patient's first visit and during the latter months of pregnancy, repeated examinations of the maternal breasts and nipples should be made to assure the infant of a satisfactory vehicle (tough and elastic nipples) in obtaining nourishment from the mother. All too often a mother has plenty of milk but fissured nipples. Breast feeding is either abruptly terminated or the infant nurses less and less until there is no milk. Fissured nipples frequently lead to breast infections after which a mother is rarely successful in breast feeding.

(c) The pediatrician comes onto the scene after the baby has arrived and all too often after the decision has been made by the mother and the obstetrician concerning the advisability of attempting breast feeding. If he sees the newborn infant early, much depends upon his handling of the mother and the care of her nipples. During the first 2 or 3 days, a normal infant will obtain the colostrum and early breast milk by nursing for short periods of time, 5 to 8 minutes 3 times a day. As soon as the breasts begin to fill and the milk is obtainable, one breast should be emptied at each feeding, the infant being allowed to nurse as long as he desires.

I think it extremely important that only water or glucose water be offered the newborn until the mother's breasts have been given the opportunity to function. An initial weight loss of from 10 to 11 percent can be considered physiologic and prelacteal feedings should not be ordered unless this weight loss is exceeded. Infants who are offered water frequently do not have "dehydration fever," and often do not lose 10 or 11 percent of birth weight. Because some mothers have a sudden increase in milk as early as the third day, one would think that their infant should be allowed to nurse on a "self-demand" schedule at this time. Infants of mothers who have been given large doses of analgesics are often drowsy during the first 24 or 48 hours of life and as a result are not vigorous nursers.





Early cereal feedings as suggested by Stewart<sup>22</sup> often provide sufficient nourishment to prolong complete breast feeding.

Every mother should be requested to continue breast feeding for at least 1 month even though complementary feedings are necessary. If she has a bountiful supply of breast milk, the infant may be nursed for from 5 to 7 months. An occasional relief bottle serves a double purpose of allowing the mother to be away at a feeding time; and conditions the infant for the time when weaning is indicated. Animals stop feeding their offspring when they erupt teeth. In human beings, this usually occurs between 5 and 7 months of age. Many infants may be weaned at this time from the breast nipple to a cup or glass, thus avoiding bottles.

It is our duty to encourage breast feeding as the infant's initial food. The purpose may be said to be twofold; (a) to nourish the infant, and (b) to establish a normal mother-infant relationship.

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<sup>22</sup> STEWART, C. A. Feeding infants. New Orleans M & S J 95 225-227, Nov 1942



# Transposition of the Great Cardiac Vessels

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IN THE past decade there has been a spectacular accumulation of knowledge about congenital heart disease. Cardiac defects of developmental origin have been classified on a sound functional and diagnostic basis, and surgical procedures have been designed and successfully instituted for the correction of these defects.<sup>4-7</sup> It is considered of value to report a recent case in which there was transposition of the great vessels plus an unusual vascular anomaly of the pulmonary circuit. In the light of recent partially successful surgical efforts by Blalock<sup>8</sup> and others to correct a related condition, this case is believed to be of current interest.

## CASE REPORT

The patient was a well-developed, well-nourished, white male infant delivered uneventfully at full term 1 January 1950 at the 12th Station Hospital, Fort Clayton, C. Z. The mother had no known infectious illness during her pregnancy. Her blood type was "O." Rh-positive. At birth the baby was cyanotic, but on two occasions within the first few hours, showed marked transient pallor. The baby was

<sup>1</sup> Board of Health Laboratory, Ancon, C. Z.

<sup>2</sup> 12th Station Hospital, Fort Clayton, C. Z.

<sup>3</sup> TAISSIG, H. B.: Congenital Malformations of the Heart. The Commonwealth Fund, New York, N. Y., 1947.

<sup>4</sup> ABBOTT, M. E.: Atlas of Congenital Cardiac Disease. American Heart Association, New York, N. Y., 1930.

<sup>5</sup> BLALOCK, A., and TAUSSIG, H. B.: Surgical treatment of malformations of heart. J. A. M. A. 128: 189-202, May 19, 1947.

<sup>6</sup> GROSS, R. D., and HUBBARD, J. P.: Surgical ligation of patent ductus arteriosus, report of first successful case. J. A. M. A. 112: 729-731, Feb. 25, 1939.

<sup>7</sup> CRUICKSHANK, C., and NYLIN, G.: Congenital coarctation of aorta and its surgical treatment. J. Thoracic Surg. 14: 347-361, Nov. 1947.

<sup>8</sup> BLALOCK, A., and HANLON, C. R.: Surgical treatment of complete transposition of aorta and pulmonary artery. Surg., Gynec. & Obst. 90: 1-5, Jan. 1950.

is an equal and opposite shunt. According to Bing,<sup>9</sup> one must postulate, therefore, that equal volumes of blood are reciprocally shunted from one circulation to the other. The possibility still exists that the shunt may, over a short period, be predominantly toward one side. Taussig<sup>3</sup> has pointed out that fluoroscopically there may be a rhythmic increase and decrease in the size of the auricles strongly suggestive of a periodic shift of the intracardiac shunt. It must be reasoned, therefore, that this same alternation in the direction of blood flow may also occur in the patent ductus.

According to Taussig, transposition of the great vessels is not an infrequent congenital cardiac defect. In a series of 100 cases compiled by Rutledge,<sup>10</sup> however, not one case of transposition was recorded. It is suggested that this condition, although not rare, is of unusual occurrence in most general hospitals. Because of this low incidence, it is considered appropriate to review the diagnostic features as well as the prognosis relative to recent surgical advances.

*Inspection reveals:* (a) No evidence of maldevelopment caused by circulatory embarrassment in intrauterine life. (Oxygenation difficulties begin with severance of the cord.) (b) Moderate to severe dyspnea increased by crying or nursing. (c) Dilatation of the neck veins. (d) Rhythmic ebb and flow of the degree of cyanosis intensified by exertion. (e) A lesser degree of cyanosis of the lower extremities compared to the upper, the line of demarcation usually lying at the brim of the pelvis.

*Chest:* (a) Rapid and shallow respirations. (b) Variable and intermittent degrees of pulmonary edema, depending on pressure relationships in the pulmonary and systemic circuits, and the presence or absence of heart failure.

*Heart:* (a) Enlarged to the right. (b) Rhythm frequently normal, but often there is a variable tachycardia. (c) Murmurs and thrills of many types may be encountered, but their interpretation is of doubtful significance.<sup>3</sup> They give little or no aid in establishing a diagnosis. (d) Electrocardiographic changes are not diagnostic, but in the event of rhythmic cyanosis with a normal electrical axis, an intracardiac shunt and transposition of the vessels must be considered. Ordinarily, right axis deviation is present.

*Fluoroscopy and roentgenography*—These studies constitute one of the greatest single aids in diagnosis.<sup>3</sup> Significant findings are:

\* CAMPBELL, J. A., BING, R. J.: ET AL. Physiological studies in congenital heart disease. physiological findings in two patients with complete transposition of great vessels. Bull. Johns Hopkins Hosp. 84: 269-278, Mar. 1949.

\* RUTLEDGE, D. I. Approach to diagnosis of common types of congenital heart disease. J. A. M. A. 141: 1290-1297, Dec. 31, 1949.

(a) Pulmonary congestion; (b) pulmonary conus smaller than usual; (c) pronounced enlargement of both ventricles; (d) narrow aortic shadow in the anterior-posterior position, and a wide aortic shadow in the left anterior oblique position; and (e) rhythmic changes in the size of the right auricle.

*Cardiac catheterization.*—Determination of the differences in oxygen saturation and differences in blood pressure in the various chambers of the heart are of value in identifying this condition. These studies, however, are limited at present to the experienced operator and only supplement the impressions arrived at by other clinical criteria. Much information can be gained by these studies regarding the direction of blood flow, septal defects, possible shunts, and stenoses. In transposition of the great vessels, there is usually a higher degree of oxygen saturation in the right auricle than in the superior or inferior vena cava. In our patient, however, this finding would have been paradoxical because the rare anomalous right pulmonary vein entering the superior vena cava elevated the oxygen tension ordinarily present, thereby more nearly approximating the oxygen tension of the right auricle. In future catheterization studies of the right heart, this anomaly should be borne in mind. Aortic blood distal to the ductus, when the foramen ovale is patent, shows a higher oxygen tension than blood proximal to the ductus.

*Surgical prognosis.*—Blalock<sup>8</sup> has recently contributed a summary of his surgical results in this relatively hopeless condition. Although his survival rate has been quite low, it is of dramatic interest that any success was obtained at all. His series included 37 patients treated by some type of extracardiac venous or arterial shunt, by the creation of an auricular septal defect, or by a combination of these two methods. The combination procedure apparently offers the greatest chance for improvement. Although in this series there were only 15 survivors, 9 of these have been the most recent consecutive cases. This implies a consistent advance in technic. Blalock infers that the eventual ideal surgical procedure must entail a true anatomic correction of the defect, but this must await the development of artificial pumping and oxygenating devices.

#### SUMMARY

In a classical case of transposition of the great cardiac vessels an anomalous pulmonary vein emptied into the superior vena cava. A source of error in the interpretation of cardiac catheterization studies is possible in the presence of this unusual anomaly.





Figure 1.—*Hidradenoma papilliferum*. The tumor consisted of glandular structures which interlaced and projected into a cystlike lumen.



Figure 2.—*Hidradenoma papilliferum*. The glandular structures were lined by a single layer of columnar cells some of which were actively secreting and which resembled apocrine gland cells.

**Case 2**—A 10-year-old man had a birth mark on the top of his head all his life. It was always "irritated by combing." Since March 1949, it had been ulcerated. It was excised on 27 October 1949. The specimen consisted of an elliptical fragment of skin and subcutaneous tissue measuring 4 by 1.5 cm. Numerous hairs projected from its surface, which also presented small cauliflowerlike growths varying in color from gray to gray-brown.

Microscopic examination revealed a tumor mass located in the upper corium. The epidermis on either side of the mass was acanthotic. On following the normal epidermis to the area of the tumor, an invagination of the surface epithelium with the formation of projecting villuslike structures into a cystic space formed by the invaginating epidermis on either side was seen (fig. 3). The villi were lined by a double layer of epithelium: an outer small cuboidal layer with round basally placed nuclei and an inner high cylindrical layer with elongated oval shaped nuclei. The latter nuclei showed subnuclear vacuolization, probably representing active secretion (fig. 4).

The stroma of the villi contained many small capillaries and was heavily infiltrated by polymorphonuclear and plasma cells, with the latter predominating (fig. 5). Lying directly beneath the villous portion of the tumor in the corium were numerous dilated apocrine glands (fig. 6). The upper corium was infiltrated by plasma cells in all areas, most noticeable in the areas underlying the tumor. Both grossly and histologically the growth seemed to have been removed with a wide margin of safety. There was no evidence of invasiveness. Clinically and histologically, the tumor was an exact counterpart of the appendage tumor described by Lever<sup>8</sup> as a "syringocystadenoma papilliferum," a term used to designate a growth with apocrine duct cell morphology.

mucous colitis, are very frequently present in cases of peptic ulcer and may persist even after the disappearance of the epigastric distress.

It is not the autonomic nervous system disturbance alone, but the particular imbalance which occurs with ulcer conflict situation that appears to favor the development of ulceration. In normal people such a conflict situation may result in appearance of transient heart-burn or epigastric distress which is relieved by milk and alkalines. But in ulcer patients the character structure is such that this conflict becomes sufficiently lasting and intense for him to develop actual ulceration.

Finding the character traits typical of the peptic ulcer patient aids in making the diagnosis of peptic ulcer. Such traits include being overly conscientious, meticulous, careful, and hard-working. These patients anticipate difficulty far in advance and rely heavily on plans to achieve their goals, all the while fearing and anticipating failure. They react badly to change, feeling inadequate to meeting the new environments as they construe them, no matter how many successes were theirs in the past. They do not allow themselves the right to make an error, and they function in many seemingly unimportant jobs as though their very existence were at stake. Such tension is made the greater and more obvious when they work under supervisors whom they consider strict and stern.

Every person has experienced the effect that sudden fear has on the colon. It is an effective drugless remedy for constipation. Everyone is aware of the potent effect of excitement on the gastrointestinal tracts of children. Because these effects are usually transient, it is not always realized that they may be prolonged if the emotional state is prolonged.

The effect of normal reflexes such as the urge to defecate and the gastrocolic reflex are qualitatively similar to the effects induced by emotional states. However, the reflex action is transient and sustained only long enough to accomplish the required physiologic result. The effects of the emotional state, however, may be prolonged or recurrent if the environmental situation which generates it persists. This might well happen often enough to keep the colon in an almost constant state of hyperactivity, particularly if the patient has a tendency to brood over his troubles.

Biochemical studies have revealed an interesting relationship between the presence of increased amounts of lysozyme to hyperactive states in the colon. This enzyme has been found in larger amounts during periods of increased activity resulting from emotional stress. The lysozyme content of the stool was also found to be greatly increased in patients with ulcerative colitis during exacerbations of the disease. Application of the enzyme to exposed colonic mucosa caused



Figure 3.—Syringocystadenoma papilliferum showing cystic invagination of epidermis with projecting villus-like structures into cystic space. Hyperkeratosis and acanthosis were evident.

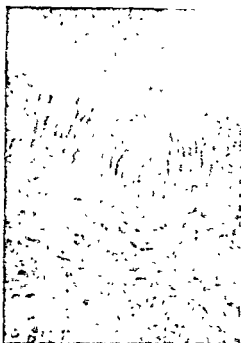


Figure 4.—Syringocystadenoma papilliferum. High magnification of figure 3 showing inner high cylindrical, secretory, apocrine duct cells and an outer row of small cuboidal myoepithelial cells.



Figure 5.—Syringocystadenoma papilliferum showing villus stroma containing small capillaries and predominant plasma cell infiltration. A few polymorphonuclear cells were present.



Figure 6.—Syringocystadenoma papilliferum showing dilated apocrine glands in corium beneath villus portion of tumor.



is almost an exact replica of the normal apocrine gland and duct cell. In some instances apocrine tumors have been considered malignant. Their essentially benign character is, however, supported by a recent thesis emphasizing their embryonal nature, which in turn determines their possible future development into benign nevoid tumors or hamartomas.



# A Comparison of Ephedrine and Desoxyephedrine in Maintaining Blood Pressure During Spinal Analgesia

CLIFFORD A. BALDWIN, JR., *Captain, MC, U S A.*<sup>1</sup>

IT HAS become the custom among anesthesiologists and surgeons while performing spinal analgesia first to administer a drug of the pressor group in an effort to overcome the sympathetic obliterative effects of the spinal analgesic and to maintain the blood pressure at as near the preoperative level as possible. Numerous sympathomimetic agents have been used by many investigators<sup>2</sup> to find the drug that would perform the desired function most efficaciously. Ephedrine and desoxyephedrine (d-desoxyephedrine hydrochloride, which is available under several trade names) were chosen for this study because they have proved to be of value and are readily obtainable.

## METHOD

No attempt was made to select the 400 patients undergoing spinal analgesia. Insofar as possible consecutive cases were used; the first 100 (group I) received no vasopressor agent initially, the second (group II) received 25 mg. of ephedrine, the third (group III) received 50 mg. of ephedrine, and the fourth (group IV) received 15 mg. of desoxyephedrine. The blood pressure of all patients was recorded in the same manner. A diaphragm-type stethoscope was fastened over the brachial artery after the correct position had been palpated digitally. A wrap-around cuff was applied and attached to a floor model mercury manometer. The blood pressure was carefully noted prior to placing the patient in position for the administration

<sup>1</sup> Walter Reed Army Hospital, Washington, D. C.

<sup>2</sup> DRIES, R. D., and DREYER, M. V.: Evaluation of certain drugs used to maintain blood pressure during spinal anesthesia; comparison of ephedrine, pseudoephedrine, methylephedrine and methedrine in 2,500 cases. *Surg., Gynec. & Obst.* 83: 312-322, Sept. 1916.

Some degree of fall in blood pressure was seen in 90 percent of the control group. It was necessary to administer a vasopressor drug to 26 percent of these patients. It appears that 25 mg. of ephedrine prophylactically is of value; the average blood pressure fall in group II was 9.9 mm. or about 40 percent of the average fall in the control group. Fifty-nine percent of the patients in this group showed a fall in blood pressure as compared to 90 percent in group I. It was necessary to repeat the ephedrine in 4 percent because of a fall in blood pressure to or below the critical level. In group III the average blood pressure fall was 4.2 mm. and only 30 percent showed a fall. The critical level was not reached in any case. The average blood pressure fall in group IV was 7.1 mm. and 40 percent of these patients showed no fall in blood pressure. Five percent required additional administration of a vasopressor drug because the blood pressure fell to or below the critical level.

#### DISCUSSION

The physiologic change underlying the fall in blood pressure following the administration of a spinal anesthetic is a segmental paralysis of sympathetic vasoconstrictor fibers to the blood vessels.<sup>3</sup> These fibers are the thoracolumbar component of the autonomic nervous system. The higher the level of paralysis produced, the greater the area of vasodilatation. It is the function of an efficient vasopressor agent to counteract this effect. It has been proved that ephedrine raises the blood pressure primarily by its direct action on the myocardium.<sup>4</sup> Desoxyephedrine raised blood pressure by increasing peripheral resistance. This difference of mode of action is important in patients with arteriosclerosis or a damaged myocardium.

#### SUMMARY

Four hundred patients were studied to determine the relative value of ephedrine and desoxyephedrine in combating the hypotension produced by the administration of a spinal anesthetic agent. Fifteen milligrams of desoxyephedrine given prophylactically is more effective than 25 mg. of ephedrine and less effective than 50 mg. of ephedrine.

<sup>3</sup> GOODMAN, L. and GILMAN, A. *The Pharmacological Basis of Therapeutics*. The Macmillan Co., New York, N. Y., 1941. p. 426.



# Herpes Zoster Concurrent With Varicelliform Eruption

## Report of Five Cases

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DONALD C. YOUNG, *Commander, MC, U S N R*<sup>2</sup>

THE relationship between varicella and herpes zoster was expressed by Von Bokay<sup>3</sup> in 1888. The foreign literature contains reports of concurrent herpes zoster and chickenpox but few reports are found in American publications.<sup>4-5</sup> Five cases were admitted to the communicable disease service of Herman Kiefer Hospital in the past 2 years.

### CASE REPORTS

*Case 1.*—A 59-year-old white woman was admitted to a general hospital complaining of pain of 1-day duration above the left eye, followed by an eruption. When a monocular rash characteristic of chickenpox appeared, she was transferred to this hospital. Physical examination showed a moderate number of vesicles on erythematous bases scattered over the abdomen, back, and upper portion of her extremities. Over the left side of the forehead and periocular region were vesiculopustular lesions, some of which were crusted. The left upper and lower eyelids were congested and edematous. The con-

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<sup>2</sup> Medical Director of the Communicable Disease Service, Herman Kiefer Hospital, Detroit, Mich.

<sup>3</sup> VON BOKAY, J.: *Magyar Orvos Archivum* Nov. 3, 1882. Cited by Barrett.<sup>5</sup>

<sup>4</sup> TOR, F. H., and others: *Communicable Diseases*, 2d edition. C. V. Mosby Co., St. Louis, Mo., 1947. p. 425.

<sup>5</sup> DURETOR, W.: Zoster with varicelliform eruption, report of case. *U S Nav. M. Bull.* 42: 156-157, Jan. 1944.

<sup>6</sup> FISCHER, A. D.: Herpes zoster and disseminated vesicles (varicella?). *J. Pediat.* 2: 301-311, Mar., 1933.

<sup>7</sup> ALMEIDA, J.: Simultaneous occurrence of herpes zoster and varicella, with report of 2 cases. *Past Grad. M. J.* 18: 175-177, Oct. 1942.

<sup>8</sup> BARRETT, C. C.: Herpes zoster and chickenpox. *South M. J.* 31: 192-196 Feb. 1928.

junctiva of the left eye was injected and the left pupil dilated and oval in shape. Ulcerated lesions, which did not extend beyond the midline, were present on the mucous membrane of the left side of the soft and hard palate. She was treated symptomatically and when discharged on the seventh hospital day the chickenpox lesions were nearly healed and the lesions of herpes zoster had improved.

*Case 2.*—A 70-year-old white man had been well until 9 days prior to admission when he had a severe headache followed by the appearance of vesicles in the right frontal and parietal areas. Involution of the vesicles, followed by formation of crusts, was noted in the ensuing 48 hours. He was admitted to a general hospital where a papulovesicular rash, clinically resembling chickenpox, developed over the neck and trunk. Examination on admission to this hospital showed an acutely ill man. An erythematous, vesiculopustular rash was present over the right side of his forehead and the right upper and lower eyelids. The conjunctivae of both eyes were injected and a purulent discharge was present. Scattered monolocular, vesicular lesions, some of which were crusted, were present over the upper thorax, back, and neck. When the patient was discharged on the ninth hospital day the lesions of chickenpox were no longer visible and those of the herpes zoster were improved.

*Case 3.*—A 15-year-old white boy was admitted to the hospital complaining of pain of 4 day duration in the right eye, followed by severe pain over the right cheek and right frontal and parietal areas. The conjunctiva of the right eye became red and the lid swollen. Later, vesicles appeared on the entire right side of the face and scalp. Physical examination showed a moderately ill boy. The entire right side of the face was erythematous and numerous vesicles were present. The right upper eyelid was inflamed but otherwise the skin was clear except for a few macules and papules on the anterior chest wall. The right anterior cervical lymph nodes were tender and enlarged. Several white circumscribed plaques were noted on the mucous membranes of the mouth. Treatment with 40,000 units of penicillin every 3 hours and 50 mg. of thiamine hydrochloride every 6 hours was begun. On the following day practically all of the lesions on the chest wall were vesicular. Ten days later nearly all the lesions were healed and the crusts separated. A purulent exudate was still present in the right eye, but the cornea was clear and the conjunctiva was only slightly injected. He was discharged on the eleventh hospital day.

*Case 4.*—A 55-year-old white woman was well until 5 days prior to admission at which time she noted several papules on the right eye-



chickenpox. Amies<sup>11</sup> centrifuged and washed the elementary bodies from vesicular fluid from varicella and then agglutinated them with serum from persons convalescing from the disease. He was able to repeat the process, using the elementary bodies from herpes zoster, and also to cross agglutinate with zoster and varicella serums and vice versa. Brunsgaard<sup>12</sup> inoculated fluid from vesicles of herpes zoster into the arm of a 2-year-old child; after 9 days vesicles appeared locally. Fluid from the vesicles was in turn inoculated into two other children; each showed a local reaction at the site of inoculation, and 14 days later crops of vesicles, which were indistinguishable from those of varicella, appeared. Roxburgh and Martin<sup>13</sup> in 1926 considered the occurrence of varicella in persons also suffering from herpes zoster first to be due to an attack on the sensory nerve roots and then to a hematogenous dissemination of the virus as the cause of the local skin lesions of varicella.

Whether the two diseases are caused by two separate viruses or by a single virus is debatable. However, the evidence points strongly toward similar viruses, if not to a single agent. Our cases were characterized first by the appearance of skin lesions typical of herpes zoster, followed after a period of 1 to 6 days by the appearance of a monolocular, vesicular eruption on an erythematous base, occurring in crops. This eruption was indistinguishable from that of chickenpox. In none of our patients was a history of previous attacks of chickenpox or herpes zoster obtained. The varicelliform eruption resolved in the manner usual for chickenpox and independently of resolution of the herpes zoster. The laboratory examinations were normal in all patients.

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<sup>11</sup> AMIES, C. R. Elementary bodies of herpes zoster and their serological relationship to those of varicella. *Brit J Exper Path* 15: 314-320, Oct 1934.

<sup>12</sup> BRUNSGAARD, E. Mutual relation between zoster and varicella. *Brit J Dermat* 44: 1-24, Jan 1932.

<sup>13</sup> ROXBURGH, A. C., and MARTIN, P. H. Concurrent herpes zoster and varicella. *Brit. J. Dermat.* 38: 286-289, July 1926.



# Periarteritis Nodosa

## Report of a Case

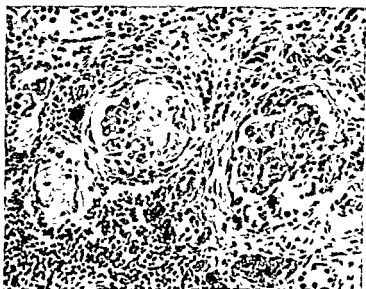
RAYMOND J. LEFFLER, *Lieutenant, junior grade MC, U. S. N.*

A 47-YEAR-OLD white woman was admitted to a naval hospital in January 1949, with the chief complaint of "asthma," dyspnea, anorexia, and extreme weakness. Her first asthmatic attack occurred 21½ years prior to admission when she was living on Guam. As a result of the severe bronchial asthma, she was returned to the United States where she required almost continuous hospitalization. Treatment with penicillin and other drugs produced hypersensitivity. Her appetite was poor because of biliousness and nausea after eating. Her weight declined gradually from 128 to 65 pounds. She also noted cramping pains in the chest.

Physical examination on admission revealed an emaciated woman. Her blood pressure on admission was 100/75, but gradually rose to 150/100 terminally. Musical and coarse rales were heard over both lungs. She had a macrocytic, hypochromic anemia. The red blood-cell count ranged from 2.7 to 4.2 million. It was 3.7 million terminally. Differential white blood-cell counts showed an eosinophilia as high as 24 percent. The sedimentation rate was 33 mm. The urine persistently showed a small amount of albumin with fixed specific gravity of 1.007 and occasional showers of red blood cells; a Bence-Jones test was negative. The predominating organism on urine culture was hemolytic *Staphylococcus aureus*. The daily output of urine was frequently below 500 cc. and rarely over 1,000 cc. The serum A/G ratio was 2.3:3.5. Blood creatinine was 2 mg. per 100 cc. blood. Roentgenograms of the chest showed pulmonary emphysema and interstitial fibrosis. All other roentgenograms revealed no abnormalities. An EKG in March 1949, 3 months after admission, revealed "probable" myocardial damage. A supportive regime, including physiotherapy and a high calory, high vitamin diet, was prescribed. She gradually improved and the asthma became less severe. However,

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*Figure 3—Section through kidney showing hyalinization of glomerular tuft, adhesions of glomerular tuft to Bowman's capsule, fibrosis of stroma, and lymphocytic infiltration of stroma*

and arterioles was thickened due to increased collagenous and elastic tissue. The arterioles showed intimal fibrosis and hyaline degeneration, but no areas of necrosis. Many of the tubules were dilated and



*Figure 4—Section through arteriole of the kidney showing a fibrinoid necrosis in part of its wall. Associated leukocytic infiltration was not found.*

hyperemia and even beginning ulceration. Possibly this enzyme may play a somewhat similar role in the production of actinomycetosis. The mucous membrane of the colon is particularly susceptible to the action of the enzyme. Emotional states are important factors in colonic dysfunction and are of major etiologic significance in chronic ulcerative colitis.

## HEADACHE

The typical migrainous patient is short of stature, with a trim well-maintained physique. He is usually of above average intelligence and willing to assume responsibilities whenever offered. Dissatisfaction in marriage is often encountered, and attacks of migraine depend largely on the amount of strain under which the patient lives. He is tense, reacts intensively, tends to worry, tires easily and often suddenly, and sleeps poorly. He is usually of above average intelligence and willing to assume responsibilities whenever offered. Dissatisfaction in marriage is often encountered, and attacks of migraine depend largely on the amount of strain under which the patient lives.

In the southeastern part of the country there seems to be a prevalence of sinus conditions and patients may undergo endless treatments to relieve the congestion without locating the etiologic agent. Impulses traveling by way of the vagus may cause congestion of the nasal mucosa, and originally such a mechanism may have been desirable to exclude noxious vapors from the nose. If, however, the stimuli are prolonged they may give rise to impairment of drainage of the nasal sinuses and interfere with normal breathing. Reactions in the upper respiratory tract are produced by excessive parasympathetic stimulation secondary to emotional situations. Fear and sadness evoke a vasoconstrictor response, with shrunken turbinates, pallid mucosa, and hyposecretion. During episodes of conflict with frustration and resentment, the nasal mucosa first becomes hyperemic, then the turbinates and the mucous membranes become swollen and secretion is increased and, finally, occlusion severe enough to interfere with breathing may occur. When the emotional conflicts are sustained the reactions are more intense and tend to become bilateral. When this condition continues, pain and tenderness develop and extend over the malar and temporal regions. These reactions have definite pathologic implications. Under these circumstances the function of the cilia is interfered with, and the swollen mucous membranes obstruct drainage

In the spleen, although there was degeneration of collagenous material of the blood vessel walls, this was no more advanced than one would expect in emaciation. Sections of the liver, adrenal glands, ovaries, colon, bladder, and heart showed fibrinoid necrosis of the vessel walls. The lesions in the heart showed little or no perivascular infiltration (fig. 5).

#### DISCUSSION

This patient had chronic severe asthma for 2½ years prior to admission. Associated disease processes included hypersensitivity to drugs, nephritis with hypertension (150/100), and terminal cerebral hemorrhage. Her asthma was not considered typical, and it was thought that there was an underlying psychogenic factor since her asthma was not related to seasonal changes or any definite allergic

and hypersensitivity to sulfonamide. Kallós and Kallós-Deffner<sup>3</sup> (quoted by Rich) made postmortem histologic sections in 21 patients with asthma; one showed periaarteritis nodosa and another demonstrated panarteritis obliterans.

Rheumatoid arthritis, which is often linked to an allergic disorder similar to those previously mentioned was produced by Selye et al<sup>4</sup> in 1944 by overdoses with corticosterone acetate in rats; this was frequently associated with Aschoff-like lesions and occasionally by periaarteritis nodosa. This finding is especially valuable in the use of adrenocorticotrophic hormones in the treatment of rheumatic arthritis.

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<sup>3</sup>KALLÓS, P., and KALLÓS DEFFNER, L. Die experimentellen Grundlagen der Erkennung und Behandlung der allergischen Krankheiten *Ergebn d Hyg, Bakt, Immunitätsforsch u. exper Therap* 19: 178-307 1937

<sup>4</sup>SELYE, H. SYLVESTER, O., HALL, C. E. and LEBLOND, C. P. Hormonal production of arthritis *J A M A* 124: 201-207 Jan 22 1944



# Isolation of Three *Salmonella* Species of Group C in One Case of Salmonellosis<sup>1</sup>

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THE isolation of more than one type of *Salmonella* from the same patient has been reported on a number of occasions, but recovery of multiple species is nevertheless unusual. Hormaeche, Peluffo, and Allepo<sup>2</sup> isolated *S. sp.* (Type Derby), *S. sp.* (Type Newport), and *S. sp.* (Type Montevideo) from a child affected with gastroenteritis. This appears to be the only previously reported patient in whom 3 *Salmonella* organisms were simultaneously implicated. Cernozubov, Filipovic, and Stavel<sup>3</sup> have reported 12 cases in which *S. typhi* and *S. enteritidis* were recovered from the same patient. The same investigators have also found two instances in which *S. paratyphi B* and *S. typhi* were isolated from patients and one instance each in which *S. sp.* (Type Senftenberg), *S. sp.* (Type Derby), and *S. choleraesuis* (var. Kunzendorf) were found in combination with *S. typhi*. Edwards and Bruner<sup>4</sup> have described multiple infections in fowls, and in 1946 Bruner and Joyce<sup>5</sup> reported 9 instances of double infection, but none with more than 2 serologic types. Other writers have reported isolated cases of double infection.

<sup>1</sup>Fourth Army Area Medical Laboratory, Fort Sam Houston, Tex.

<sup>2</sup>HORMAECHÉ, PELUFFO, and ALLEPO. Quoted in Edwards and Bruner.<sup>4</sup>

<sup>3</sup>CERNOZUBOV, FILIPOVIC, and STAVEL. Quoted in Edwards and Bruner.<sup>4</sup>

<sup>4</sup>EDWARDS, P. R., and BRUNER, D. W. Occurrence of multiple types of paratyphoid illness in infections of fowls, with special reference to two new *Salmonella* species. J. Infect. Dis. 66: 218-221, May-June 1940.

<sup>5</sup>BRUNER, D. W., and JOYCE, B. J. *Salmonella* types encountered by 15th Medical General Laboratory. Am. J. Hyg. 45: 19-24, Jan. 1947.

agglutinins. Although our patient had a titer of  $1:10$  . . .

in subsequent specimens Jager and Lamb also found that their two strains of *S. sp.* (Type Oramenburg) were lethal when injected intraperitoneally into mice. All 3 of our strains failed to produce death in mice when injected intraperitoneally in doses of up to 9 million organisms.

In vitro studies were performed with each of the three *Salmonella* strains for sensitivity to penicillin, streptomycin, bacitracin, polymyxin, aureomycin, and chloramphenicol using the tube dilution method, FDA broth<sup>2</sup> as a medium, and complete inhibition after 24 hours as the end-point (table 4). On the basis of these tests, it is possible that polymyxin or chloramphenicol might be clinically useful. Stansly, Shepherd, and White<sup>3</sup> found susceptible strains of gram-negative bacteria inhibited by concentrations between 0.5 and 16 micrograms per cc. On this basis our *Salmonella* strains, two inhibited by 0.78 and one by 3.12 micrograms per cc., could be classified as sensitive. Blood levels between 30 and 100 microgram per cc. are obtainable with doses of 2 to 4 grams of chloramphenicol daily. During the time the patient was harboring *Salmonellae* we did not have sufficient quantities of either of these antibiotics for a therapeutic trial.

TABLE 4.—Antibiotic sensitivity

<i>Salmonella sp.</i> type	Penicillin	Streptomycin	Polymyxin	Bacitracin	Aureomycin	Chloramphenicol
	Units	Units	Micrograms	Units	Micrograms	Micrograms
Oramenburg . . . . .	1	10	3.125	2.0	50	10
Bareilly . . . . .	1	10	78	2.0	50	5
Montevideo . . . . .	1	10	78	250	50	5

<sup>2</sup> If 50 percent of growth (measured turbidimetrically) of the control is taken as a criterion of sensitivity, lower figures for sensitivity to chloramphenicol are obtained.

# SUMMARY

*S. sp.* (Type Oramenburg), *S. sp.* (Type Bareilly), and *S. sp.* (Type Montevideo) all belonging to the *Salmonella* Group C containing somatic antigens VI and VII, were isolated from a single patient. Serologic studies indicate that the patient made a poor immune response to these organisms, as measured by the development of agglu-

<sup>2</sup> Food and Drug Administration Manual, Vol. I, Tests and Methods of Assays for Certification of Antibiotic Drugs, 1942 p. 2.

<sup>3</sup> STANSLY, P. G.; SHEPHERD, E. G.; and WHITE, H. J. Polymyxin, new chemotherapeutic agent. Bull. Johns Hopkins Hosp. 81: 43-54, July 1947.

tinins. This raises the question of the pathogenicity of the organisms, as does the fact that none of the three species was pathogenic for mice. *In vitro* sensitivity, studies indicate possible sensitivity to polymyxin and chloramphenicol, but not to penicillin, streptomycin, bacitracin, and aureomycin.







# The Mobilization of the Medical Supply and Equipment Industry

ERNEST T. KRETSCHMILLER, *Captain, U. S. A. F. (MSC)*

SUCCESS in modern warfare depends on efficient mobilization of economic resources. If we become involved in another major war, the efficiency with which we mobilize our manpower, productive facilities, and natural resources will be decisive in determining the outcome.<sup>1</sup> The great European powers entered World War I with huge and magnificently equipped armies but with sufficient economic reserves to support those armies for only a few months. It was late in 1915 before effective mobilization of the national economies was inaugurated. By the time the United States entered the struggle, there was a great deal of British and French experience in economic and industrial mobilization available for our guidance. Our people did not seem willing to accept this advantage, however, and we learned our lessons the hard way, wasting billions of dollars and millions of irreplaceable man-hours in misguided efforts to produce military equipment in great volume. Time did not permit us to correct our initial errors and the United States came to the end of the First World War still unable to supply its troops with more than a fraction of the material requirements.<sup>2</sup>

*Planning between the wars.*—Fortunately, the Government and industrial leaders realized the errors into which our unpreparedness in planning had led us. It was resolved that the United States should never again fall into the same state of economic unpreparedness, and Congress and the Armed Forces made active efforts to remedy our shortcomings. The amended National Defense Act of 1920 provided an outline under which economic mobilization, procurement, and procurement-planning could be accomplished.<sup>3</sup> By its provisions, the

<sup>1</sup> BALDWIN, H. W. *Price of Power* (Published for the Council on Foreign Relations) Harper & Brothers, New York, N. Y. 1947 Chap. 11

<sup>2</sup> Industrial College of the Armed Forces' *Economic Mobilization* Washington D. C. 1948. p. 10.

<sup>3</sup> *Ibid.*, p. 11.

Assistant Secretary of War was assigned the "supervision of the procurement of all military supplies and other business of the War Department pertaining thereto and the assurance of adequate provision for the mobilization of matériel and industrial organizations essential to wartime needs."<sup>4</sup>

The administration organization for the accomplishment and supervision of Army Medical Department procurement planning was established on three levels: Office of the Assistant Secretary of War, Office of the Surgeon General, and the depots of the Medical Department. On 25 October 1921, a procurement division was established in the Office of the Assistant Secretary of War, consisting of a current supply branch and a planning branch. For the purpose of preparing plans for industrial mobilization, the latter branch was divided into allocation, labor, finance, foreign relations, and transportation and storage sections.<sup>5</sup>

*In the Office of the Surgeon General, the next echelon of administrative organization was established. Here, in June 1922, a procurement planning section was set up in the finance and supply division, and was charged with the collection of information and compilation of data pertaining to sources of supply.*<sup>6</sup>

In the field, the administrative organization of procurement planning was controlled by the location of Medical Department depots and was effected, to a lesser extent, by the establishment of War Department Procurement Districts, within the framework of which procurement planning was performed. The supply arms and services, however, were authorized to establish their own Nation-wide organization, grouping two or more War Department districts into one district and thus reducing the number of field offices. The Medical Department established four procurement districts, in each of which a procurement planning office was included. Personnel devoted to procurement planning in the field were also engaged in current procurement, except in the New York General Depot where personnel were assigned exclusively to procurement planning.

With the administrative organization and the personnel described, the Medical Department sought to plan its procurement for the next war, and thus avoid the delays which hampered World War I efforts. The purpose of this planning was to ascertain both the requirements for another conflict, and the manufacturing facilities from whence they could be obtained. To the Office of the Surgeon General was assigned the former, and to the field offices, the latter tasks.

<sup>4</sup> The National Defense Act, 4 June 1920 Section 5a (41 Stat L 764)

<sup>5</sup> Memorandum Orders No 1 Office of the Assistant Secretary of War 25 October 1921

<sup>6</sup> Report of The Surgeon General, U. S. Army, to the Secretary of War 1922.

After a field office had determined that a manufacturer was primarily concerned with producing medical supplies or equipment it would apply to the Assistant Secretary of War for an allocation granting to the Medical Department a virtual monopoly on the production of the manufacturer affected and authorizing a detailed production survey. The facility surveys were designed to secure information relative to the number, types, and condition of the buildings; the types and adequacy of transportation; the number, sex, and training of employees; the source and quantity of power employed; the types and sources of raw materials used; and the rate at which the manufactured item could be produced.

Based on facility surveys and computed requirements, schedules of production were prepared and presented to manufacturers for approval. These schedules obligated neither the Medical Department nor the manufacturer. By 1938 this task was virtually completed. Such model plans usually have an "Achilles heel," and this was no exception. If the procurement planning officer lacked interest or ability, the survey was hasty and superficial. If the manufacturer lacked enthusiasm for Government orders or was skeptical of procurement planning, not enough information could be obtained for an adequate survey. These difficulties were further increased by the scarcity of travel funds that prevailed during the two decades of peace and that greatly restricted the number of visits procurement planning officers could make to factories. It became necessary to resort to correspondence in many instances.<sup>7</sup>

*Supply experiences in World War II.*—Industrial mobilization plans were predicated on the belief that the transition from peace to war would be sudden, and that there would be an M-day when war would be declared. It was assumed that Congress would authorize the agencies of the War Department to contract directly with manufacturers allocated to them by the Assistant Secretary of War. In 1939, the need for more active preparation for war became apparent, but such preparations bore almost no relation to any previous planning. Steps were initiated to increase gradually the size of the Regular Army and of the National Guard. The items of medical supply necessary to meet these projects were purchased in the regular manner from the lowest bidder. No provision was made so that manufacturers allocated as sources for the items needed could be dealt with directly to facilitate purchase.

By the latter part of 1942, the Nation had gone a long way toward total war production, and the Medical Department began to feel the

<sup>7</sup> Much of the pre-World War II planning data was furnished by the Supply Office, Office of the Surgeon General, Department of the Army, Washington, D. C., 1950.

equipment; (c) prepare specifications for medical items; (d) perform developmental engineering in connection with medical items; and (e) formulate plans for industrialization and procurement in the event of a mobilization. Personnel for the Agency is provided by the three Departments. Chiefs of the Agency and of Divisions are rotated among the services, the tenure of each office being 2 years.

Because of its vulnerable location it would be quickly moved in case of another conflict. The reason for the present location is the proximity of the purchasing branch to the greatest concentration of suppliers.

With the establishment of the Industrial Mobilization and Procurement Planning Division within the Agency, the services now have the necessary tools to prevent the repetition of post- World War I and World War II policies in planning, purchasing, and related functions. This division (a) formulates, within the policies of the Munitions Board, plans for industrial mobilization and procurement in the event of mobilization, as prescribed by the Armed Forces, and (b) plans, directs, and coordinates the functions of the Operations Branch, Planning Branch, Materials Branch, and Survey Branch.

The more important functions of these branches are to: (a) review all current sources of medical supplies and prepare requests for tentative allocations for submission to the Munitions Board; (b) establish and determine quantities of end items required from each industrial establishment in the event of mobilization; (c) prepare estimates and make recommendations regarding reserves and stockpiles of items; (d) inquire into mobilization procurement of each item with special attention to such obstacles as governmental licensing of patents, and strategic dispersal of sources; (e) compile and/or compute reports on raw material, basic material, component parts, and packaging requirements for all end items; (f) accomplish surveys for both mobilization and current procurement purposes; and (g) search for potential sources of supply and submit recommendations regarding the desirability of obtaining capacity in industrial facilities.

*Determination of requirements.*—World War II requirements competed with priorities and shortages for top honors. In an effort to eliminate future troubles in this field, the Army and Navy have, since the war, supplied to the Industrial Mobilization Division requirement figures based on factors herein explained. These requirements are determined for each 90-day period of the first year following M-day, for 180-day periods for the following 2 years, and for each year following, up to the end of the mobilization planning period. The requirements are determined for the separate geographic areas involved and grouped for total requirements.

from the sinuses, and so render the tissues more vulnerable to bacterial invasion.

### ALLERGY

Today we hear a great deal about allergy, and, with the new preparations which are given to desensitize the person, more emphasis than ever is being placed on this common complaint. Asthma, hay fever, eczema, and hives may have a very definite psychosomatic basis. The personality of the asthmatic and, even more important, of his parents, plays an important role in the development of the symptoms. The parent is found to be domineering, often in a gentle way, and often overly protective. The asthmatic himself is aggressive, nervous, demanding, and there is a constant conflict between his self-expression and aggressive tendencies and the necessity to suppress them in order to secure love and avoid rejection. The allergic person is usually very suggestable and his symptoms may be more likely precipitated by what he hears or sees, rather than by what chemically affects him. Allergists uniformly agree that psychic factors can bring about changes in the threshold of sensitivity to allergens.

### SEXUAL DYSFUNCTION

Sexual maladjustment is commonly seen in general practice and more unhappiness in marriage is due to this than perhaps any other cause. Most certainly many neurotic symptoms are brought to the surface by this cause. Frigidity, impotency, or lack of libido, are all symptoms of emotional conflict. It may be fear or it may be disgust. Perhaps it is conflict or guilt over masturbation, it may be a homosexual panic, or perhaps it is an Oedipus complex, or a fear of castration. The type of sexual behavior is certainly not inherited, it is acquired and comes as a result of conditioning. Injections of hormones will not correct the difficulty; they may even aggravate the symptoms.

### CONCLUSIONS

As stated at the beginning of this article, no physician today can afford to limit his attentions only to the somatic side of disease, as no illness can be thought of as being entirely psychological or entirely organic. Unfortunately, there is a tendency for physicians to feel that if the right chemical formula can be found, the pathologic changes in the person will thereby be corrected; and surgeons are apt to feel that, if a pathologic lesion can be diagnosed its removal will correct the symptoms. If they cannot discover organic pathologic changes, they may dismiss the patient with the statement that

Requirements are divided into those for initial issue and those for replacement issue. Initial issue requirements are so phased in planning that they will be available on activation of the units concerned although issue is to be made at a later time. These requirements are based on allowances specified in Tables of Organization and Equipment for the type units, Tables of Allowances, and/or Medical Department Equipment Lists. Replacements issue requirements are determined by use of either normal or combat rates, depending on disposition of commitments of troop strength involved. The normal rate is derived from peacetime usage and is applied to troops not in combat. The combat rate is applied to troops in combat and is based on World War II issue experience as modified by the adoption of replacement or supplemental items and by changes in use-trends or therapeutic methods in the interim.

Requirement planning must also allow for acquisition of increased depot stocks to cover increased depot stock levels and to fill the extended supply pipeline resulting from active combat operations. Additional planning is likewise necessary to cover requirements of selected items whose demand is limited to certain areas because of diseases peculiar to those areas or by the type of warfare anticipated therein. With reference to civilian needs, the United States Public Health Service is responsible for its requirements. Inasmuch as the Armed Forces plan to allocate to themselves a maximum of only 50 percent of a factory's production, it is believed that the total civilian requirements will be adequately cared for with the balance.

*Plant surveys.*—The M-day plan is designed to effect an orderly distribution of contracts among all manufacturers in the event of mobilization, and it provides for close contact between the Armed Services Medical Procurement Agency and each industrial facility producing medical supplies. Initially, the Agency advises the Munitions Board of a manufacturer whose production capacity would be desired in the event of an emergency. The Munitions Board then designates the Armed Services Procurement Planning Officer as the "coordinator" if the Agency has the primary interest in the facility. The "coordinator" takes charge of all nontechnical administrative planning for use of the plant's production capacity in an emergency. The procedure of planning requires an interview with management of the plant, at which time the manufacturer is informed of the types and quantities of supplies needed from his plant in the event of an emergency. Management is asked to examine these requirements and then to estimate its production capabilities in relation to the requirements. It is asked to assume that there will be no expansion in the facility and that materials and manpower will be available.

*Tentative schedule of production.*—After the procurement agency has secured from the management the necessary capacity and product data, they prepare a tentative schedule of production and submit it to the company for acceptance. If accepted by the manufacturer, it is objectively determined that the quantity of supplies listed on the schedule can be obtained when required. On acceptance of this schedule, the company is asked to name selected subcontractors and suppliers that would be needed to accomplish the production and to estimate their requirements of tools, equipment, and materials that would be needed to achieve the production schedule. When completed, the schedule of production is forwarded to the Munitions Board for approval and record.<sup>9</sup> There is nothing in these schedules which bind either the Government or the firm contractually.<sup>10</sup>

*Stockpiling of strategic materials.*—The stockpiling of scarce strategic and critical materials for military and essential civilian use in a national emergency is essential. Huge-quantity production requires large stocks of the necessary raw materials. If the source of part or all of these raw materials is a foreign one, stockpiling is the only sure way to avert a wartime shortage.

*Status of planning.*—The Armed Services Medical Procurement Agency plans for the wartime procurement of all medical supplies and equipment used by the Armed Forces. Planning involves the determination of adequate future sources of supplies and materials. It also includes the function of establishing or taking measures to assure the availability of supplies and equipment. About 650 principal manufacturers of medical and dental supplies have been listed. New manufacturing facilities are continually being established and these 650 manufacturers not only supply the needs of the war, but must also continue to supply the needs of the peacetime hospitals throughout the nation. At present they are also supplying large quantities of medicines to foreign countries.

The previously mentioned manufacturers will continue to require huge quantities of raw materials. The raw materials for those items required by the Armed Forces have been determined and the Armed Services Medical Procurement Agency has data on the amount of these materials that the manufacturer will require to supply the end items. This data is made possible principally by the establishment of bills of material for all items required. Bills of material are now on hand for about 80 percent of all important items.

<sup>9</sup> Armed Services Medical Procurement Agency: Armed Services Medical Procurement Data. Brooklyn, N. Y., 1950. pp. 8-9.

<sup>10</sup> The Munitions Board: Allocation of Private Industrial Capacity. Operating Procedure Annex No. 47. Washington, D. C., 1948. p. 23.

Although most of the medical supplies and equipment used by the services are the same or similar to items used by civilian agencies, the military requirement often necessitates changes in the packaging and form of an item. These changes might be called military characteristics. The most common items used by the average person in his daily work will be available in time of war in sufficient quantity to military personnel. The principal shortages will be in those items that are not now readily available to the civilian population, and that are difficult to manufacture in large quantity. Insofar as items are concerned, more money will be spent for drugs and biologic products than for supplies and equipment.

#### PROBLEMS BESETTING PREPAREDNESS PLANNING

*Foreign versus American surgical instruments.*—Prior to 1939, about 85 percent of the surgical instruments used in this country were imported from Germany. American jobbers were able to pay a 55 percent duty and still sell imported instruments for less than those made in this country. When importation of surgical instruments ceased in 1939, our manufacturers increased their production by inaugurating an extensive training program, adding new equipment, and working more than one shift. Some of the larger firms with more skilled artisans worked three shifts. Further expansion was accomplished by means of subcontracting. Although this resulted in appreciable increase in production, it was necessary to enlist the production facilities of silverware, jewelry, and cutlery manufacturers. On the whole, these newcomers joined the older firms in producing instruments in sufficient quantities, at the required time, and to specifications—in spite of shortages of critical basic materials and trained personnel.

With the return of the war-ravaged countries to production, it soon became evident that the importation of surgical instruments in quantity was only a matter of time. At present, the inflow is large, excellent in quality (though not necessarily superior to ours), and low in price. The net result to our manufacturers is a cutback in production and the layoff of skilled workers. The subsidizing of producers who are adversely affected by foreign imports, does not solve the problem. Only continued use of the skills of these trained men will guarantee the high production needs of another emergency. To the economist, the high tariff is a headache but to the mobilization officer it seems to be the only solution.

*Geographic concentration.*—In recent years, like industries have tended to concentrate in particular areas because of seaport facilities, concentration of population, transportation availability, national resources, or the presence of distribution facilities. The medical supply



and general military conditions were critical. In World War II pressure of criticism arose from two new quarters both concerned with the mental side of human activity.

In 1942 a personnel selection procedure was introduced. Any deficiency in physical assessment was likely to be revealed by this procedure and particularly so in the stages of its development and the application of "press button" recording and sorting. For the first time, however, a full and comprehensive study of the soldier's work was undertaken and assessment of physical fitness consequently began to take proper place as a stage in the employment of manpower and the make-up of an Army. Pressure of criticism also came from the psychiatrists. The existing system of categorization did not in itself indicate a person's mental or emotional make-up and the war was not long in progress before the wastage from assessed psychiatric disabilities suggested the need for more accurate definition of these factors.

The British War Office was acquainted with work being done in Canada which resulted in the introduction of the PULHEMS system in 1943. Both medical and personnel aspects had been closely studied and selected groups of Army intake were examined according to the system. All aspects of the problem and the solution suggested by the PULHEMS system were considered. The British Army authorities had earlier decided that it was "both undesirable and totally impracticable to introduce a new system once war had started."<sup>2</sup> Not even such a system as PULHEMS could alter this decision.

#### POST-ARMISTICE DEVELOPMENTS

In 1946 the devising of a new system of categorization was taken up by an Inter Service Committee and the present PULHEEMS system was officially adopted by the Army on 1 April 1948. The new system has also been accepted by the Royal Navy, Royal Air Force, and the Ministry of Labor and National Service. The title PULHEEMS pays tribute to its origin in the Canadian Army PULHEMS system. The purpose of the system is to assist in assigning men to the type of employment for which they are most suited. Early emphasis was placed on the necessity for a clear picture of a man's physique as it affected his functional ability as contrasted with the former methods of assessment based on anatomic abnormalities.

The qualities contributing to the final assessment were essentially the same as in PULHEMS. E. E. representing the need of Royal Navy and Royal Air Force for a statement for many of their tradesmen of the precise degree of visual acuity in each eye.

<sup>2</sup> FLETCHER, R. T. PULHEEMS, a new system of medical classification. *Brit. M. J.* 1: 83-88, Jan. 15, 1949.

The *degrees of fitness* were in general in accordance with the following table which also shows their relation to climatic restriction.

Degree	Functional efficiency	Climatic restrictions
1.....	Above average.....	None.
2.....	Average.....	
3.....	Moderate functional defect.....	
4.....	As P 1.....	Service in temperate climate only.
5.....	As P 2.....	
6.....	As P 3.....	
7.....	Marked functional defect.....	Service in United Kingdom only.
8.....	Unfit for military service on existing standards.	

This table is an oversimplification and it is necessary to study each "quality" in more detail.

- P (Physical capacity).**—Factors to be considered are age, build, strength, stamina and resistance to exposure. All degrees from 1 to 8 can be assessed.
- U (Upper limbs).**—Strength, range of movement, and general efficiency of upper arms, shoulder girdle, and neck are to be considered. In the case of assessment of both upper and lower limb functions, any pathologic condition will have a general constitutional effect and there is no need for specific climatic limitation and, therefore, for the use of degrees 4, 5, 6 under qualities U and L. The same considerations apply to H.
- L (Lower limb).**—The factors to be considered in assessment of degrees 1, 2, 3, 7, and 8 are strength, range of movement, and efficiency of feet, legs, pelvic girdle, and lower back.
- H (Hearing).**—A simple assessment of auditory acuity is supplemented by a guide to the effect of ear conditions on the quality P.
- E E (Eye-sight).**—Uncorrected vision is classified in all degrees 1 to 8 together with corrected vision in each eye separately.
- M (Mental capacity).**—This quality is best assessed by the practical method of finding whether the man is able to understand his duties as a soldier. As such a method of assessment involving trial and error would be wasteful, the soldier's "M" assessment must be judged by consideration of: (a) his selection test results, (b) his record of school and of occupational progress, and (c) the impression he gives on personal interview.
- S (Emotional stability).**—The introduction of this quality into assessment practice and even more, its expression in degree was regarded doubtfully by many interested parties. This doubt found expression in the short-lived restriction on the recording of the S degree to medical documents.

On the assessments of both M and S qualities there is special limitation not found with other qualities. Degree 1 implies functional efficiency above average which it was considered extremely difficult to assess. This degree, therefore, is not used and 2 under M and S indicates normal or above. In M assessment there is no climatic limitation and degrees 4, 5, and 6 are not used therefore. The S quality has an

LE (lines of communication everywhere): Normally employed in lines of communication or base areas in any part of the world but may be employed in a forward area in any role which is not primarily a fighting one.

LT (lines of communication temperate): Normally employed in the lines of communication or base areas in temperate climates only; but may be employed in a forward area in any role which is not primarily a fighting one.

BE (base everywhere): Employable in the base area only in any part of the world.

BT (base temperate): Employable in the base area only in temperate climates.

HO (home only) Employable in the United Kingdom only.

*Administrative instructions.*—Earlier reference has been made to the place of PULHEEMS in the allocation of manpower. A special pamphlet is prepared for commanding officers who are informed that all officers should take an intelligent interest in the basic principles of the system which in its increased accuracy and scope will ensure fuller use of everyone's potentialities.

#### DISCUSSION

It is perhaps unfortunate that the medical assessment of World War I should leave behind it a term of opprobrium. "C 3" As for the individual so also for the system, failure is remembered and yet World War II opened without any revolutionary advance in applying clinical appreciation and mensuration. There was greater definition and many would say that functional considerations were not neglected in these definitions. Initial examination by a board was maintained and there does not appear to have been the same difficulty as in World War I about the uniform standard.

As was inevitable, there was much reassessment in the service, and some criticism of the initial assessment by civilian boards but the small minority created and attracted much attention. Of one intake of over 5,000, 92 percent were in category "A" and over 6 percent in B.1. The efforts to use men of low grade of category or physique or stamina bulked large in proportion to numbers but pressure of manpower shortage was extreme. The demand for tradesmen and technicians increased the shortage of men for training, say, as infantry, in which good physique was essential.

The increased literature of medical assessment is interesting. The pamphlet of medical categories in World War II ran to 18 pages. Canadian PULHEEMS to 128 plus 43 in tables of classification of Army duties and the PULHEEMS Medical and Administrative instructions run to 78. It is doubtful if the necessity for learning any assessment

system by reading and application is thoroughly appreciated. There is also need for knowledge of, and balanced sympathy with, the soldier in his work. These are sometimes difficult for the young medical officer to acquire.

It may also be asked if ordinary medical knowledge is sufficient to assess ability to withstand severe and prolonged strain or exposure, stamina, and liability to break down. The obvious negative answer reinforces the need for instruction of examining medical officers—a problem for the administrator and often an unwelcome imposition on the medical officer of a new attitude of mind. Reverting to the medical board and the work of a number of doctors whether they be military or civilian, the problem of the uniform standard is not necessarily solved by a new method of assessment unless it carries the calculation of ability much farther than seems possible at present. A review of PULHEEMS shows how often attention is turned back to the quality P so much of which was sought in the assessment of “ability to withstand strain” in World War I.

The need for inclusion of something of the nature of M and S qualities of PULHEEMS was undoubted but having qualified to be “qualities” what do we read about them? “With regard to M and S, degree 1 implies functional efficiency ‘above average’ which it is considered extremely difficult to assess; thus degree 2 under these qualities indicates normal or better.”<sup>2</sup> The medical examiner in search of assistance may well ask if assessment is made any easier by making 1 into 2. There is some encouragement for the medical examiner handling difficult human material in the work which continues at the user end of the manpower problem into ability required in various employments. The association of workers on the various stages of allocation of manpower cannot but tend to mutual appreciation of margins of error and their reduction.

#### SUMMARY

The history of the assessment of physical fitness for service in the British Army reveals increasing analysis with some recurrence of problems and terms. If medical examiners are not born they must be made—to get to know the practice of any system. Recent advances came from the Canadian PULHEEMS system and, in their British form of PULHEEMS, emphasize functional capacity, peg mental factors and are linked to employment standards. There seems to be greater hope of proving norms and estimating capabilities if the critical attitude to previous systems continues along with the cooperation which produced PULHEEMS. The birth of a system essentially the same for Royal Navy, Army, and Air Force is in itself a notable event which may be of historic importance.



All know they will serve; all actually want to serve; but to volunteer they need to have the advantages pointed out to them because of the intensity of their prime motivations. There are good and substantial reasons why they should volunteer:

*\$100 pay.*—None should jeopardize their right to this additional pay. This subject needs no further elaboration.

*Assignments.*—The Army, because of its almost world-wide service, cannot make commitments as to place of service. For the time being, however, the Army can give assurance as to type of assignment. If an applicant has had 2 or 3 years of training in a specialty, there are vacancies at present in all specialties to which he can be assigned. As time goes on and they are brought to duty in the priorities prescribed by Congress, many cannot be given assignments within their training sphere. Some may have to be given quick courses to qualify them for assignments outside their chosen fields. Others may have to be assigned in related fields. Volunteers, by virtue of being on the ground first, therefore stand the best chance of getting assignments to their professional liking. This will be an advantage to the applicant in the furtherance of his professional career.

*Opportunity for unusual service to the Nation.*—Those who have volunteered and are on duty when this article is published will have known the importance of their service in the preceding months. There will probably be no time which will offer more opportunity for public service than the months of October, November, and December, because the number of physicians and dentists on duty with the Army will be far below the minimum needed. As a consequence, the work to be accomplished will tax the capacity of everyone and the experience will be interesting and varied. Even in the early months of the new year there will be unlimited opportunities for all volunteers. There is nothing which renders more self-satisfaction than the knowledge that one is wanted and needed. Service rendered under such circumstances remains throughout life a source of pleasant reminiscences.

*Specialty credit.*—All who serve with the Armed Forces will have an opportunity to record their professional activities in a personal booklet which may be adjudicated by the specialty boards. There is good possibility that considerable credit will be given in this manner to apply on specialty accreditation. Those who volunteer and come on duty earlier, have a better chance for assignments within their professional spheres, and at the same time have a better chance of obtaining additional credit toward their specialty boards.

*Avoidance of registration.*—To some, the avoidance of registration alone is good and sufficient reason for immediately obtaining Reserve commissions and applying for active duty.



## Armed Forces Standards for Dental Examinations and Classification

As a basis for developing uniformity in dental forms, recording, and reporting procedures in the Army, Navy, and Air Force, there have been adopted Specifications for Conducting Dental Examinations and a Dental Classification of Individuals. It has long been recognized that this was a fundamental necessity toward future studies for standardization. This accomplishment will be of great assistance to the Dental Task Group of the Committee on Standardization of Medical Forms, Recording, and Reporting Procedures in the Department of Defense.

The following is the memorandum of the declaration of policy of the Department of Defense, which requires that they become effective in the Army, Navy, and Air Force.

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### THE SECRETARY OF DEFENSE WASHINGTON

20 October 1950.

MEMORANDUM FOR THE SECRETARY OF THE ARMY  
THE SECRETARY OF THE NAVY  
THE SECRETARY OF THE AIR FORCE

SUBJECT: Standardization of Dental Classification, and of Specifications for Conducting Dental Examinations

1. In order to effect uniformity in the nomenclature and definitions used in the Department of Defense with respect to dental examinations and classification, it is hereby declared to be the policy of the Department of Defense to use the following specifications and definitions:

#### *Specifications for Conducting Dental Examinations*

*Type 1—Ideal Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination; full mouth intra-oral, periapical and posterior bite-wing roentgenograms; when indicated, percussion, thermal, and electrical tests, transillumination, and study models.

*Type 2—Routine Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination; posterior bite-wing roentgenograms; periapical roentgenograms, when indicated.

*Type 3—Modified Routine Examination.*—Mouth mirror and explorer examination; adequate natural or artificial illumination.

## BOOK REVIEWS

**THE ORIGIN OF MEDICAL TERMS** by Henry Alan Skinner, M. B., F. R. C. S., *Professor of Anatomy, University of Western Ontario* 370 pages. The Williams & Wilkins Company, Baltimore, Md., publishers, 1949. Price \$7

This thoroughly delightful book gives further evidence of the value and need for greater familiarity with the derivation of medical terms. When words originating from the same or cognate roots can be associated in the mind of the student of medicine the burden of learning a large vocabulary of special terms is not only lightened but becomes a pleasure in itself. The author has arranged the volume alphabetically rather than by subject giving cross references when indicated and this seems the most logical way of handling this type of material. Each entry is a little essay and short biographies of many men whose names have been attached to various medical terms have been sandwiched in with the other words. Derivations of words are often obscured by a veil of antiquity and the subject of false popular etymologies or of controversy. When a reasonable doubt exists the author explains the uncertainty and may even give more than one possible derivation for the same word thereby protecting the innocence of the novice. He never forgets that the history of a medical term is intimately linked with the history of medicine itself and thus one not only gleans much useful knowledge of words but of medical history as well.

I cannot help wishing he had given the derivation of the proper names included whenever such derivation was known but perhaps this was not done because of the infinitely greater confusion surrounding the derivation of most proper names. The interesting and little-known derivation of aspirin is not given although the word is listed. Possibly this is because it is a trade name. Some of the most interesting words in the language are or started out as trade names. Bedlam is traced back to Bethlehem but the derivation of Bethlehem, a proper name, is not given. It is more difficult to understand why in the case of a few words such as battery, luminal and methodist no attempt at explaining the origin of the word is made. The uninitiated is left in doubt as to whether the first two syllables of hydrobromic and hydrochloric stem from the Greek hydor (water) or the related English hydrogen. The fact that a few words are out of their alphabetical place (iac and men-) indicates a haste in preparation not in keeping with the total effect.

The author has rendered a great service to students of medicine which I sincerely hope will not go unappreciated. The fact that this and other books and articles on this subject have appeared recently is an indication not only of the need for them but of a lamentable failure in the proper compilation of our medical dictionaries.—Colonel W. G. Brandstadt, MC, U. S. A.

**THE EPITOME OF ANDREAS VESALIUS** Translated from the Latin with Preface and Introduction by L. R. Lind, Ph. D., *University of Kansas* with anatomical notes by C. W. Asling, M. D., Ph. D., *University of California*, and a foreword by the late Logan Clendening, M. D. 103 pages of translation and 28 pages of Latin Text. The Macmillan Co., New York, N. Y., publishers, 1949. Price \$7.50.

the complaint is imaginary, or to give some placebo. In common parlance, they may "knd the patient along," rather than search for a deeper etiologic reason. If the physician would take the time to investigate the social and psychological factors in the person's psychopathology, many serious disturbances might thus be prevented.

The family physician in the past was the confidant of his patients, and, undoubtedly, by the process of mental catharsis helped his patients through difficult times. Today the general practitioner may not be willing to spend the necessary time to relieve the patient's tensions and, consequently, the individual is driven back into himself.

Although the medical profession and the general public are today more aware of psychological etiology, the stresses of life appear also to be increasing, and something definitely needs to be done to help people to a more stable existence. Most certainly, the general practitioner can do a great deal to help patients to gain this necessary insight. If they find themselves unable to do so, the earlier psychiatric assistance is obtained, the more easily the underlying psychopathology is corrected.

#### REFERENCES

1. MCCARTNEY J. L. Anxiety overstimulating the thyroid gland. Transactions of the Third International Gouter Conference 1948, p. 49.
2. ALLAN, F. N. and KAUFMAN M. Nervous factors in general practice. J. A. M. A. 133: 1137-1138, Dec. 15, 1948.
3. JOHNSON, M. E. New Orleans M. & S. J. 101: 117, Sept. 1948.
4. Morbidity and Mortality Report. Los Angeles Department of Health, Dec. 11, 1948.
5. BINKLE, C. Psychological phenomena in cardiac patients. Bull. New York Acad. Med. 24: 687, Nov. 1948.



Though only a schoolbook for the Sixteenth Century medical student, the Vesalian Epitome, or by its full title, *De Humani Corporis Fabrica Librorum Epitome*, has become for the twentieth century man of science a classical work of general interest. Since the original editions of this work disappeared from the bookshops long ago, it was decided at the time of the quadricentennial anniversary (1943) to publish an electrotypes facsimile edition of the original issue of the work together with its English translation (the first one ever made), a short biography and evaluation of the author, and additional anatomic notes which bring the slightly obsolete Vesalian anatomic knowledge up to date. The English translation of the text is followed by a facsimile of the 14 folio pages of the 1543 Latin edition, reduced here to quarto size. This includes 11 anatomic full-page woodcuts, probably executed by Jan Stephan van Calcar, a contemporary of Vesalius.

The translation of any 400-year-old work into one of our modern languages is difficult, especially when the work deals with specific subject matter in a rapidly changing era of science. Some of us whose linguistic knowledge and eyesight suffice for such a job may find some enjoyment in comparing the translator's words with the reduced facsimile lines of the original and will surely disagree with Dr. Land in many grammatic, syntactic, and semantic points. Those who are defective in Latin or in vision will have to be satisfied with the translation as it is, backed up by liberal general interpretation and modern terminologic notes at the end of each chapter. It appears that the translation was first completed and the anatomic notes attached later. The translated text would have gained much in meaning if the translator himself had known human anatomy and medical history, or if at least he had paid more attention to marginal Greek notes of Vesalius and to the modern anatomic notes of his collaborator. The publication is typographically correct and executed in excellent taste, as all monographs which form a number of Dr. Fulton's historic series of medical classics sponsored by the Historical Library of Yale Medical Library.

—Lt. Col. C. F. Mayer, MC, A. U. S.

**PRINCIPLES AND TECHNIQUES FOR COMPLETE DENTURE CONSTRUCTION**, by Victor H. Sears, D. D. S., *formerly Professor of Prosthetic Dentistry, New York University; Certified by American Board of Prosthodontics.* 416 pages; illustrated. C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$5

This volume combines ideas from two earlier books, "Prosthetic Papers" and "Basic Principles in Dentistry," with additional material pertaining to technique and practice. From an elementary discussion of anatomy to directions for the maintenance of complete dentures, the text is well planned and presented. The chapters dealing with physics point out some of the mechanical problems involved, and show why and how basic physical laws should be considered and applied to full denture construction. The effects of forces, leverages, inclined planes, and other factors on denture stability are explained.

The subjects of tooth selection and occlusion are dealt with at some length. The author believes that the nonanatomic forms of teeth are best suited to complete denture stability and tissue preservation. His system of occlusion recognizes the value of bilateral and protrusive balance. In this respect his concept of occlusion represents a stand between the school which advocates the use of anatomic teeth with balance in eccentric positions and that favoring nonanatomic forms without balance.

Closing chapters present a practical approach to delivery and maintenance problems. The suggestions for adjustment, alteration, and refitting of dentures are of particular interest. An expanded glossary would help to orient the

The discussion of jaundice includes a full-page chart illustrating the physiology of jaundice.

The illustrations are excellent and include 42 new black and white photographs and 3 new colored plates. Professor Boyd is one of the few physicians who can write entertainingly as well as authoritatively on medical subjects. His command of English, his knowledge of medical history and his frequent pertinent quotations make his books a pleasure to read—*Col H R Gilmore, Jr., MC U S A*

**A GUIDE TO GENERAL MEDICAL PRACTICE** by Martin G. Vorhaus, M D. *Attending Physician, Hospital for Joint Diseases, New York City* 244 pages. The Macmillan Co., New York, N Y., publishers, 1950. Price \$3.50

This book, intended for interns and the younger staff members of hospitals, presents the philosophy and personal outlook of a man who has been a general practitioner for 30 years. The problems faced on starting a general medical practice are discussed. The answers given and the discussion appear to be for rather immature readers. Much controversy can arise from Dr Vorhaus' opinions, especially his regard of the internist and general medical practitioner as practically the same—*Commander H A Lyons, MC, U S N*

**ELECTROCARDIOGRAPHY, Fundamental and Clinical Application**, by Louis Wolff M D. *Visiting Physician, Consultant in Cardiology and Chief of the Electrocardiographic Laboratory, Beth Israel Hospital, Associate in Medicine, Harvard Medical School* 187 pages, illustrated. W B Saunders Co., Philadelphia Pa., publishers 1950. Price \$4.50

Instruction in electrocardiography has been aided by the availability of many texts. It is refreshing to find in this small volume a different approach. This book, divided into two parts, is concerned with that portion of the electrocardiogram which is ventricular in origin. The auricular complexes, arrhythmias et cetera, are not included. Part 1 presents some of the basic principles involved in the electrical phenomena associated with ventricular contraction. In orderly fashion the text progresses through a consideration of the normal and abnormal states, including bundle branch block, hypertrophy, and the effect of muscular injury. Diagrams amply complement the clear, simple text. Part 2 entitled Clinical Electrocardiography, presents a discussion of electrocardiograms which may be obtained in some of the common clinical conditions that involve ventricular muscle. The subjects of myocardial infarction, hypertrophy, and bundle branch block are discussed in some detail, other common conditions, to a lesser extent. Tracings are reproduced and analyzed with frequent reference to the pertinent discussion given in part 1. Controversial subjects as such are not discussed, but occasional statements and concepts which are not wholly accepted by all who are interested in electrocardiography are noted. The reproduction of many of the tracings might have been improved so that, for example, measurement of the duration of Q waves would be possible. The clear simple style and manner of presentation of the subject is, however, of such general excellence, that the book is recommended as a valuable source of information for any practitioner desiring to know more about elementary electrocardiography—*Col. J S Taylor, MC, U. S. A.*

**COLLECTED PAPERS OF THE MAYO CLINIC AND THE MAYO FOUNDATION**, edited by Richard M Hewitt, B A, M A, M D., A B Nevling, M D., John R Miner, B A, Sc D; James R Eckman, A B, M A, Ph D., M Katharine Smith, B A; Carl M. Gamball, A B, M D, M P H and Florence Schmidt, B S E. Volume XLI, 1949, published June 1950. 820 pages; illustrated. W B Saunders Company, Philadelphia, Pa., publishers, 1950. Price \$10.50

This volume, similar to the various specialty Year Books, is a compilation of selected material from the Mayo Clinic and the Mayo Foundation covering the period 1 December 1948 to 30 November 1949. It contains 746 papers, 108 of which are from the Proceedings of the Staff Meetings of the Mayo Clinic. As in previous volumes, this edition is divided into sections on diseases of the alimentary tract, genitourinary tract, ductless glands, blood and circulatory organs, skin (including syphilis), head, trunk and extremities, chest, brain, spinal cord, and nerves. There are sections on radiology, physical medicine, anesthesia, gas, intravenous therapy, and miscellaneous subjects. The sections on the alimentary tract and chest diseases are particularly comprehensive. This volume, covering a wide range of interests, is recommended to all medical officers in the Armed Forces.—*Lt. D. L. Andrus, MC, U. S. N.*

**CLINICAL USES OF INTRAVENOUS PROCAINE**, by David J. Graubard, M. D., *Assistant Visiting Surgeon, Cumberland Hospital; Assistant Visiting Orthopedist, Kingston Avenue Hospital, Brooklyn, New York; formerly Assistant Surgeon, Reconstruction Hospital Unit, New York Post-Graduate Medical School and Hospital, New York; and Milton C. Peterson, M. D., Visiting Anesthesiologist, Research Hospital, Kansas City, Missouri; formerly Anesthesiologist, New York Post-Graduate Medical School and Hospital; Associate Professor of Anesthesia, New York Post-Graduate Medical School, New York.* Publication Number 73, American Lecture Series. 104 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

The authors of this book have probably had a wider, more varied, and more successful experience with the use of procaine intravenously than anyone else working in this field. There is an interesting commentary on events leading to the reintroduction of this method of treatment. Detailed points in technic for such disorders as traumatic pain, cardiac arrhythmias during anesthesia, the pain of acute poliomyelitis, postoperative pain, serum sickness, sensitivity, pruritus, and a miscellany of untoward conditions are concisely presented. The book gives the impression, however, that procaine given intravenously is a panacea for pain from any cause. Unfortunately this is not true. The authors fail to emphasize some of the inherent dangers accompanying the use of this drug intravenously. The pharmacologic background is inadequately covered.—*Lt. (jg) R. W. Lykins, MC, U. S. N.*

**A MANUAL OF CARDIOLOGY**, by Thomas J. Dry, M. A., M. B., Ch. B., M. S. in Medicine, *Associate Professor of Medicine, University of Minnesota (Mayo Foundation); Consultant in Section on Cardiology, Mayo Clinic.* 2d edition. 353 pages; illustrated. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$5.

The second edition of this book on cardiology has accomplished well the aims of the author to "present again in as precise a form as possible the present-day concepts of cardiovascular diseases" and to "reflect the major advances which have been made since—the first edition." The subject matter is logically arranged, being introduced by a 6-chapter discussion of fundamental diagnosis and pathologic physiology and followed by 14 chapters dealing with the various abnormal conditions and their treatment. Peripheral vascular problems as such are not included.

The discussion of the individual clinical subjects is particularly worthy of comment. The Heart in Certain Metabolic States; Cor Pulmonale; Neoplastic Involvement of the Heart; Hypertensive Heart Disease; Cardiac Neurosis; Pregnancy; Anesthesia and Surgical Operations in Relation to Organic Heart

Disease are well covered in brief but adequate chapters. Disturbances of Rate, Rhythm and Conduction, Coronary Disease, and Congestive Heart Failure are expertly handled, stressing particularly diagnostic criteria and therapy. The chapter on rheumatic heart disease in its various complicating aspects is unusually well outlined. To note an unusual feature in classification, the endocarditides, disseminated lupus erythematosus, periarteritis nodosa, and diffuse scleroderma are included under a subheading entitled Diseases Apparently Related to the Rheumatic State. The 4-page coverage of Syphilitic Heart Disease probably reflects the current trend to regard the condition as one of the minor phases of present day cardiology. The chapter on congenital heart disease is the outstanding feature of the book. Here in outline form, considered by individual conditions, thoroughly briefed for quick reference, is an adequate starting point for the establishment of diagnosis. The remarks on developmental embryology, general symptomology, prognosis, and treatment are also helpful.

The manual is generously illustrated throughout with clear reproductions of pertinent roentgenograms, electrocardiograms, and schematic diagrams. The text is easily readable, terse, and well styled. In brief, this publication is pared to essentials yet complete, adequate, and as comprehensive as a manual of 355 pages can be. It is highly recommended as a reference text for those seeking a handbook on the subject.—Col. C. L. Leedham, MC, U. S. A.

**UROLOGICAL SURGERY**, by Austin Ingram Dodson, MC, F. A. C. S., Richmond, Va., *Professor of Urology, Medical College of Virginia; Urologist to the Hospital Division, Medical College of Virginia, Urologist to Crippled Children's Hospital, Urologist to St. Elizabeth's Hospital, Urologist to St. Luke's Hospital and McGuire Clinic*, with 12 contributors. 2d edition. 875 pages, 645 illustrations. The C. V. Mosby Co., St. Louis, Mo. publisher, 1950. Price \$11.50.

This second edition of the only comprehensive American reference work on urologic surgery should be a welcome addition to any urologic library. It is of interest not only to the urologist, but to the general surgeon required to perform urologic operations and to the urologic resident who should find it of inestimable value. This edition emphasizes progress in treatment and operative techniques since the original publication in 1944. Reorganization of the text and the inclusion of more and better illustrations constitute a distinct improvement. Various sections have been ably contributed by collaborating specialists. This book does not deal with operative technical procedures alone, and therein lies its greatest merit. The sections on preoperative and postoperative care, fluid and electrolyte balance, blood transfusion, and treatment of shock with repeated references to diagnostic procedures are worthy of careful study by all because these factors are frequently more important for a satisfactory surgical result than the operation. The portion dealing with technical operative procedures includes indications for operation, choice of anesthesia, and probable surgical difficulties or accidents. Much of the newer controversial, technical procedures as ureterosigmoidostomy, et al., have been avoided.

—Col. G. R. Hamilton, MC, U. S. A.

**NURSING CARE OF THE SURGICAL PATIENT** (formerly Textbook of Surgical Nursing, 4th edition, by McFee and Keller), by John Pettit West, M. D., *Attending Surgeon, St. Luke's Hospital, New York, Assistant-Attending Surgeon, New York Hospital, New York; Assistant Professor of Clinical Surgery, Cornell University Medical College, New York; Mabelva Wylie Keller, B. S., R. N., Formerly, Chief Operating Room Nurse, St. Luke's Hospital,*

*New York, and Anesthetist, St. Luke's Hospital, New York.* and *Harmon, B. A., R. N., Instructor in Surgical Nursing, Cornell University, New York Hospital School of Nursing, New York; Assistant Head of Nursing Service, New York Hospital, New York.* 5th edition, 784 pages, illustrated. The Macmillan Co., New York, N. Y., publishers. Price \$4.

The purpose of this revision was to emphasize the nursing duties in the care of the patient. The chapter on operating room nursing has been deleted and that is now considered to be a definite specialty. This is a concise, easy-to-read textbook which should aid the nurse in performing her duties more intelligently by combining the basic knowledge of common surgical diseases with an understanding of the principles of various diagnostic and therapeutic procedures. Review questions and references are given at the end of each chapter. The illustrations of various types of mechanical equipment used in caring for the surgical patient are excellent.—*Lt. E. H. Macha, MC, U. S. N.*

**A TEXTBOOK OF GYNECOLOGY**, by Arthur Hale Curtis, M. D., *Emeritus Professor and Chairman of the Department of Obstetrics and Gynecology, Northwestern University Medical School; formerly Chief of Gynecological Service, Passavant Memorial Hospital, Chicago,* and John William Huffman, M. D., *Associate Professor of Obstetrics and Gynecology, Northwestern University Medical School; Attending Gynecologist, Passavant Memorial Hospital, Chicago.* 6th edition, 799 pages, with 461 illustrations, chiefly by Tom Jones, including 37 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$10.

This edition is in all respects similar to its predecessor. It has been completely reset with a bold faced and more readable type. An increase of about 50 pages has resulted more from changes in format than from new material. The chapter on embryology has been rewritten, and several new and pertinent illustrations added. Two short chapters on urethral conditions have, logically, been combined with the chapter on urinary tract problems. One of the most important features of this edition is the fact that the senior author has shared the responsibilities and work of revising the book with a confrere who can carry on the aims of the volume which he has thus far so ably achieved. With this collaboration of two authors, each an authority in his own right, we can, for years to come, look forward to further editions which will be dependable, authoritative, and readable.—*Commander R. E. Crowder, MC, U. S. N.*

**THROMBOSIS IN ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES**, Publication Number 41, American Lecture Series, by Edward A. Edwards, M. D., F. A. C. S., *Diplomate of American Board of Surgery, Clinical Associate in Anatomy, Harvard Medical School; Instructor in Surgery, Tufts College Medical School; Consultant in Peripheral Vascular Disease, Joseph H. Pratt Diagnostic Hospital and Hospital of the Massachusetts Soldiers' Home; Chief of Vascular Clinic, Boston Dispensary.* 74 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.

This is a brief, concise, dramatic presentation of thrombosis of the lower extremities. The first 50 pages are devoted to etiology, pathology, clinical findings, and treatment. The remainder of the book reports 19 cases. The case presentations rather completely cover the gamut of symptoms and findings in thrombosis of the lower extremities and thereby offer a quick and ready reference to the busy practitioner.—*Col. A. E. White, MC, U. S. A.*

**YOU AND YOUR HEART.** A Clinic for Laymen on the Heart and Circulation, by H. M. Marvin, M. D., T. Duckett Jones, M. D., Irvine H. Page, M. D., Irving S. Wright, M. D., and David D. Rutstein, M. D., with foreword by Paul D. White, M. D. 306 pages illustrated. Random House, New York, N. Y., publishers, 1950. Price \$3.

This book reduces to simple terms the whole field of cardiovascular diseases. Written in an optimistic vein the authors present their subject to the lay public in a clear, concise manner. Unlike some popular books on medical subjects, this one succeeds in portraying to the layman a basic understanding of heart disease without making him feel like an amateur diagnostician. Self-diagnosis is properly discouraged, emphasis being placed on the necessity for close supervision of any serious heart condition by a competent physician. The information presented should be a source of great comfort to all victims of serious heart disease. It should be even more valuable to those whose functional or minor organic disease keep them in a state of morbid invalidism through fear. The authors answer numerous questions simply accurately, and at the same time explode many popular fallacies concerning diseases of the heart and blood vessels.—*Commander R. J. Whipple MC U. S. N.*

**MODERN TRENDS IN ORTHOPAEDICS** edited by Sir Harry Platt, M. C., M. S., F. R. C. S., *Professor of Orthopaedic Surgery University of Manchester; Consultant Adviser in Orthopaedics to the Ministry of Health President, Société Internationale de Chirurgie Orthopédique et de Traumatologie.* 497 pages illustrated. Paul B. Hoeber, Inc., New York, N. Y. publisher, 1950. Price \$35.

This British publication consists of 14 monographs or essays on the major subjects of orthopedics and traumatology each written by a British authority. Its scope is limited by the editor in his introduction to "some of the problems, old and new, still to be faced." It was hoped that concise and critical evaluation of many of the newer forms of orthopedic treatment would be included but in general the authors confined their discussions to the history of their subjects, etiology, diagnosis, and pathology most of which is already contained in standard orthopedic texts. The inclusion of this material precluded more detailed and specific criticism of many new and controversial subjects. For example the first chapter "Fracture Treatment," contains 17 pages on the biology of fracture healing, 8 pages of mechanics of fracture treatment, and less than 4 pages of modern trends in technique.

Girdlestone's chapter on tuberculosis of bones and joints contains an excellent discussion of lateral rachiectomy and other operations for decompression of the spine, but does not mention streptomycin. In fact the author's attitude toward chemotherapy in tuberculosis is very conservative. Osmond-Clarke's chapter on scoliosis is outstanding and should be required reading for orthopedic residents. Space does not permit discussion of each of the chapters but those on paralysis, vascular lesions, bone dys-trophies, and chronic arthritis are among the best. In general this volume is desirable but not essential reading for those interested in orthopedics. The price of the volume seems to be higher than one would expect for a book of this size and binding.—*LT. (JG) G. A. Mead, Jr. MC, U. S. N.*

**PROCEEDINGS OF THE FIRST CLINICAL AGTH CONFERENCE.** John R. Mote, M. D., Editor. 607 pages, illustrated. The Blakiston Co., Philadelphia, Pa., publishers, 1950. Price \$5.50.

This book is the result of a conference sponsored by Armour and Company and held in Chicago in October 1949. It comprises the total of 52 individual pro-

ceedings. Of some importance to the average clinician are the papers which present the effects of ACTH on arthritis, gout, and allied diseases. This is primarily a reference work for those performing research involving ACTH. The illustrations are good.—*Lt. G. W. Hyatt, MC, U. S. N.*

**SURGICAL TREATMENT FOR ABNORMALITIES OF THE HEART AND GREAT VESSELS** by Robert E. Gross, M. D., *William E. Ladd Professor of Child Surgery, Harvard University Medical School, Boston, Mass.* The Beaumont Lecture, Wayne County Medical Society, Detroit, Mich., 2d printing. 72 pages, illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$2.

This classic little monograph represents the second printing of the Beaumont Lecture of 1946. It includes under one cover material which appeared originally in several journals and forms an authoritative review of the subject up to the time of its presentation by an outstanding surgeon and pioneer in this field. The subject matter is confined to congenital cardiovascular lesions amenable to surgical correction, and includes chapters on patent ductus arteriosus, defects of the pericardium, tetralogy of Fallot, right aortic arch, double aortic arch, anomalous right subclavian artery, and coarctation of the aorta. In several instances the discussion is enriched by case reports and personal experiences of the author. The photographs and drawings liberally illustrating the text are clear and well chosen. Because the text represents material originally presented 4 years ago, it is not surprising that more recent subjects, such as cardiac catheterization, commissurotomy in mitral stenosis, and the use of arterial grafts in coarctation of the aorta are not included.

This monograph will be of interest to surgeons, cardiologists, and pediatricians.—*Lt. Col. B. E. Pollock, MC, USA.*

**NUTRITION IN HEALTH AND DISEASE**, by Lenna F. Cooper, B. S., M. A., M. H. E., Sc. D., *Consultant Dietitian and Formerly Chief of the Department of Nutrition, Montefiore Hospital, New York City; Formerly Food Director, University of Michigan; Dean of School of Home Economics, Battle Creek College; Supervising Dietitian, U. S. Army, World War I; President, American Dietetic Association, 1937-38; Edith M. Barber, B. S., M. S., Writer and Consultant, Food and Nutrition; Food Editor, General Features Syndicate; Formerly Food Editor, New York Sun; Lecturer on History of Cookery and Public Relations for Home Economists, Teachers College, Columbia University; and Helen S. Mitchell, A. B., Ph. D., Dean of the School of Home Economics, University of Massachusetts; Formerly Principal Nutritionist, Office of Defense, Health and Welfare Services; Professor of Physiology and Nutrition, Battle Creek College.* Associate Author Henderika J. Rynbergen, B. S., M. S., *Assistant Professor of Science, Cornell University-New York Hospital School of Nursing; Formerly Director of Dietetics, American University Hospital, Beirut, Lebanon; Food Clinic Dietitian, Vanderbilt Clinic, Presbyterian Hospital, New York; Food Clinic Dietitian, Barnes Hospital, St. Louis; Nutritionist, Community Health Association, Boston.* 11th edition, revised and reset. 714 pages; illustrated. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$4.

The authors of this book are highly experienced and well recognized as authorities on the subject of nutrition in health and disease. The material is accurate and in accord with other experts in the field. The authors express themselves easily and simply. Through their writing they inspire an appreciation of the role that every nurse plays in teaching nutrition to her patient and his family. The book is physiologically sound and thoroughly practical in presenting up-to-date principles of nutrition and dietetics. This work will serve as an excellent

renal failure in that the author believes that "these two headings comprise the majority of cases which clinician and pathologist alike encounter." The first third of the book is devoted to a discussion of the nephron in general, the other tissues of the kidney (blood vessels, connective tissues, and so forth) and the general reaction of the kidney to injury. The separate renal diseases, including "crush kidney," in their acute and chronic states are discussed in the remainder of the book.

It is indeed unfortunate that such a fine piece of work should be so mechanically poor. It is obvious that it was inadequately proofread, for hardly a page is free of some error in spelling or punctuation. At times these result in ambiguity. It also seems apparent that the book was not reviewed by any one outside the author's field, such as a general practitioner for whose class it is intended, or by one who did not have an intimate knowledge of the subject, for the author's phraseology and lack of consistency in terminology make digging out the desired information difficult. If carefully rewritten this timely book could be of great value to urologists and general practitioners.

One hundred illustrations, mostly photomicrographs, adequately illustrate the various points of discussion. A modest list of references is included, and the work is indexed.—*Commander W. S. Hansen, MC, U. S. N.*

**MEDICAL DIAGNOSIS, Applied Physical Diagnosis**, edited by Roscoe L. Pullen, M. D., F. A. P. C., *Professor of Graduate Medicine, Director of the Division of Graduate Medicine, and Vice Dean of the School of Medicine, Tulane University of Louisiana, Senior Visiting Physician, Charity Hospital of Louisiana at New Orleans; Consultant in Medicine, Veterans Administration Hospital, New Orleans, La.; Consultant to the Surgeon General Department of the Army Washington D. C.* 2d edition. 1,119 pages. Illustrated with 601 figures, 45 in color. W. B. Saunders Co., Philadelphia, Pa., publishers, 1950. Price \$12.50.

This excellent book on physical diagnosis covers a greater range than most volumes on the subject. It is not written especially for the internist but is primarily for the medical student, the intern, and the general practitioner. The medical specialist will, however, find it of value as an up-to-date review of the abnormalities he should look for when he makes a general physical examination. No intern or young general practitioner will fail to benefit from a careful study of the 24 chapters written by 23 contributors (11 surgical and 12 medical) many of whom are authorities in their special fields.

The subtitle "Applied Physical Diagnosis" seems more appropriate than the title "Medical Diagnosis," because the book does not especially deal with the concepts and syndromes of general diseases which so often concern the internist. This weakens the book as a text on medical diagnosis but does not detract from its value on physical diagnosis. The medical implications of certain abnormalities found in "surgical" fields are not brought out, i. e. epistaxis (in rheumatic fever), Mikulicz's syndrome (in sarcoidosis), iridocyclitis (in rheumatoid arthritis), and cataracts and/or deafness (in congenital heart disease in an infant or child). These minor points may be important in leading the clinician to a diagnosis. The chapter concerning the skin and the one on oral diagnosis are both useful in this regard, however, pointing out the diagnostic significance of certain diseases and lesions. More about general and local signs often found useful in evaluating the seriousness of an illness, or which furnish clues to the diagnosis of an obscure condition should have been included. Perhaps an expansion of the first two chapters on the medical history and introduction to examination of the patient might be helpful for this purpose. Why must the beginner in medical diagnosis learn certain facts in the "school of hard knocks" when expe-



blended clinicians can record them? Further, the recording of more correlative findings will stimulate and assist the beginner in the development of his own clinical acumen. The tyro of today often requests the laboratories to carry much of his burden.

As with any excellent book this one contains a few minor faults. On page 46 the name of Grey Turner is misspelled; in the discussion of jugular vein pulsation no distinction is made between deep and superficial jugular vein pulsations, no mention of the tophus of gout is found, no roentgenograms showing the lesions of pulmonary tuberculosis or lung carcinoma are included, no special mention of primary atypical pneumonia is made; the roentgenogram on page 134 depicting lobar pneumonia is not typical and is more suggestive of atelectasis, isolated dextrocardia is not mentioned under dextrocardia, the chapter on the extremities is weak in its section on arterial diseases but is superior on venous diseases; the chapter on electrocardiography is excellent for the advanced student, but for the beginner its mathematical approach is too formidable. A small diagram outlining the essential findings accompanying many of the roentgenograms would be helpful to the beginner.

Although each chapter is excellent, certain chapters not usually found in a book on physical diagnosis, such as those on the diagnosis of breast cancer, gynecologic and obstetric diagnosis, the infant and the child, the aged, the psychiatric patient, and the endocrine survey of the reproductive system are very useful. Many chapters have bibliographies which will prove helpful in directing the reader in further study. There is a good index.

—Col. R. P. Johnson, MC, U. S. A.

**REGIONAL DERMATOLOGIC DIAGNOSIS, A Practical System of Dermatology for the Nonspecialist**, by Ervin Epstein, M. C., *Consultant in Dermatology and Syphilology to the Oakland Area Veterans' Hospital and Mt. Zion Hospital; Consultant to the Tumor Board at the Highland-Alameda County Hospital; Co-Editor of "Dermatologica" ("International Journal of Dermatology"); Abstract Staff of "Excerpta Medica," Diplomat of the American Board of Dermatology and Syphilology; Member of American Academy of Dermatology and Syphilology and of the Society of Investigative Dermatology; Former president of the San Francisco Dermatological Society; Secretary-treasurer of the Pacific Dermatologic Association; Secretary of the Section on Dermatology and Syphilology of the California Medical Association.* 328 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$6.

The author strives for simplicity by using the location of the eruption, which is one of the basic dermatologic diagnostic approaches, as the basis for his handbook. Because each of the 31 chapters deals with a certain part of the body, he has to repeat himself since many of the common dermatoses are widespread. This repetition is reflected again in the tables at the end of each chapter, wherein certain features of the diseases discussed in the chapter are listed. The author describes adequately the diagnostic aspects and comments briefly on the therapy of the common conditions which cover about 75 percent of the general dermatologic practice. The illustrations are excellent. Among the recent advances mentioned are ACTH therapy, Hargrave's cell in bone marrow, Mohr's chemosurgical technic, and aureomycin and chloramphenicol. Three short appendices include (a) the location of the lesions in the 20 most common dermatoses, (b) an outline for local therapy, and (c) the characteristic cutaneous lesions complicating internal diseases. In spite of its repetition and inadequate presentation of the cutaneous manifestations of systemic diseases this book gives the

student and general practitioner a clearly written and well illustrated monograph on the diagnosis of common skin diseases—*Lt (jg) S L Moschella, MC, U S N.*

**PROGRESS IN BIOCHEMISTRY** A Report on Biochemical Problems and on Biochemical Research since 1933, by Felix Haurowitz, M. D., D. Sc., *Professor of Chemistry, Indiana University, Bloomington, Ind.* Interscience Publishers, Inc., New York, N Y., publishers, 1950. Price \$7.50.

This excellent review of biochemical progress is the first English edition following four German editions. The author has comprehensively reviewed the contributions of the past 20 years in biochemistry. The table of contents, the index, and the subdivisions of the text make any given item readily accessible. The style of the text is refreshing when compared to the usual book of this type. Some readers may object to the author's didacticism. This minor fault is more than compensated for by his brevity and clarity. There are excellent lists of references at the end of each chapter.

Chapter I is devoted to isotopes and should be of value to the reader who has limited time. The use of these substances in investigations is discussed throughout the book in appropriate places. The chapters concerning proteins and protein metabolism are interesting and pertinent. There is an excellent chapter on enzymes. Included here is the mechanism of blood clotting. The information presented on the anticoagulants is scant. Enzymes are elsewhere dealt with in appropriate sections. The volume will be helpful to physicians, biochemists, scientific investigators, and technicians—*Lt Comdr H A Weiss, MC, U S N.*

**THE CYTOLOGIC DIAGNOSIS OF CANCER**, by the Staff of the Vincent Memorial Laboratory of the Vincent Memorial Hospital, a Gynecologic Service affiliated with the Massachusetts General Hospital Boston, Mass., the Department of Gynecology, Harvard Medical School. Published under the sponsorship of The American Cancer Society. 250 pages illustrated. W B Saunders Co Philadelphia, Pa., publishers, 1950. Price \$6.50.

This book is an excellent manual written to serve as a guide and reference to those engaged in the interpretation of cytologic smears. It is based on a wide experience of competent observers gained in the study of over 3,000 cases (about 27,000 smears) in the past 8 years. Included are chapters dealing with radiation changes, the respiratory tract, stomach, genitourinary tract, and peritoneal fluid. The book is lucidly written, profusely illustrated with photomicrographs, drawings, and color plates and is well arranged. Such a book has long been needed in the field of exfoliative cytology.

—*Lt Col J W Simpson, MC, U S A.*

**THE MASK OF SANITY**, An Attempt to Clarify Some Issues About the So-Called Psychopathic Personality, by Hervey Cleckley, M. D., *Professor of Psychiatry and Neurology, University of Georgia School of Medicine, Augusta, Ga.* 2d edition. 563 pages. C. V Mosby Co., St. Louis, Mo., publishers, 1950. Price \$6.50.

This revised second edition written 10 years after the original publication is again superbly written in a delightful narrative and descriptive style. The subject material, the psychopathic personality, is portrayed in terms that make stimulating reading of a complex subject. In this edition, the author, while not formulating any profound new concepts, has combined his own research and clinical study of male and female patients with an extensive review of the literature. The book attempts to explain dynamically the behavior of the psychopathic personality. This interpretive material constitutes a distinct improvement over the first edition.

# Prophylactic Odontotomy

LUCIAN SAMYD, Captain, U. S. A. F. (DC)

SINCE the etiology of dental caries is still obscure, any dental procedure which would reduce the number of teeth that have to be extracted because of the effects of caries, would be a step forward. Prophylactic odontotomy consists of the removal by cutting of a defective part of a tooth in order that the area so treated may be protected from a threatened onset of caries, the operation being confined to those morphologic imperfections called pits and fissures (1). The name prophylactic odontotomy was originated by Qumby (2). Following a paper by Hyatt in 1922, there was a great deal of interest in prophylactic odontotomy. In a short time, 19 State dental societies, the American Dental Association, the Canadian Dental Association, the Oral Commission of the Federation Dentaire Internationale, and 13 other dental organizations officially endorsed the idea that particular care and attention should be given to developmental pits and fissures, whether occurring in primary or secondary teeth, and whether decay was present or not (3). However, additional research did not support this enthusiastic attitude. A more rational and conservative feeling predominates today. There is some evidence that the filling of early cavities or even caries-free susceptible fissures, reduces the number of teeth that have to be extracted, but as yet there is no statistical study that demonstrates accurately the value of such procedures, as compared with other forms of dental care in preventing dental decay (4).

*Relationship of developmental defects to caries.*—Some specific areas of certain teeth are highly susceptible to decay (5). These areas occur in the imperfections in enamel when perfect fusion of embryonal enamel lobes does not take place (1) (6) (7). If we consider the developmental lines evidenced on the occlusal surface of the molar teeth as one ramifying developmental line, the entire adult dentition would have 164 (6). Clinically, a fissure is distinguished from a normal groove by examination with a sharp explorer, after having isolated and dried the tooth. In a pit or fissure, the tip of the sharp explorer will sink below the surface at the point of entrance and cling between the narrow walls of the pit (8). However, the



precautions for cleansing or handling described. Preparation of reagents is given in detail as well as notes on preservation and stability. Normals for some reason do not accompany each procedure but follow in an appendix. Technique and calibration procedures are described in simple stepwise fashion. Modifications suitable for most commonly used photoelectric instruments are given. Each procedure in this manual is outlined with sufficient completeness to enable any technician who is at all familiar with photoelectric instruments to perform the determination.

The chemicals used in the preparation of the reagents are described in detail, the name, formula, purity, and brand are given. A notable exception is that the source of ampules of Evan's blue dye for blood volume determination is not given. This practice of specifying brand names borders on commercialism in that chemical reagents meeting the specifications of the committee on analytical reagents of the American Chemical Society should be of sufficient purity to replace the brand names often mentioned despite the author's comments in the introduction.

The varied sources of procedures are from the world's scientific literature. The complete bibliography is a credit to the author's judgment and reflects the extent of his chemical research with its medical applications. His comments and criticism show wide experience. For example, in the Koppanyi barbituric acid procedure, the author comments, "This method is non-specific, neither very sensitive nor accurate and unsuitable for certain derivatives of barbituric acid. It is included here because of its wide-spread use. The best recovery possible is approximately 85 percent. For precise work, ultraviolet fluorescent methods should be used."

For a first edition it is remarkable that this manual is essentially free of errors.

In spite of the comment in the introduction that manufacturers of spectrophotometers issue booklets suggesting technical information necessary to operate these instruments, a review or short chapter on photometric colorimeters and spectrophotometers would contribute to the completeness of this otherwise excellent manual.

This manual consists of pages inserted in a seven-ring loose binder. Although the publisher claims that such an arrangement will allow the owner of the manual to insert new procedures when available, it seems that a permanent binding would be better so that pages would not be lost.

The price of the work is higher than that of any comparable manual. Although the effort expended on the part of the author was tremendous, the high price may keep this publication from many laboratories. The original cost, however, will be more than offset by the time saved by the laboratory director who frequently peruses literature for more precise technical procedures and their adaptation to instruments at hand in his laboratory.

—Lt. Comdr H. C. Sudduth, MC, U S N

**FRACTURES**, by Paul B. Magnuson, M D, F A C S, *Professor of Bone and Joint Surgery and Chairman of the Department, Northwestern University Medical School; Attending Surgeon Passavant Memorial Hospital and Wesley Memorial Hospital, Chicago;* and James K. Stack, A B, M D, *Northwestern University Medical School, Chicago.*

Illustrations J. B. Lippincott Co., Philadelphia, Pa., publishers, 1944.  
Price \$7

This edition brings up-to-date an excellent book on fractures, written to meet the needs of the man who first sees the fracture. A chapter on fundamentals

**WILLIAMS' OBSTETRICS**, by Nicholson J. Eastman, *Professor of Obstetrics, Johns Hopkins University, and Obstetrician-in-Chief to the Johns Hopkins Hospital*. 10th edition. 1,176 pages; illustrated. Appleton-Century-Crofts, Inc., New York, N. Y., publishers, 1950. Price \$12.50.

This text, well known for its comprehensive presentation of the principles and practice of obstetrics, has again been thoroughly revised to record the important advances of the past decade. The authorship has returned to the medical school in which it originated and retains in general its original distinguishing features. The organization into 10 sections and the rearrangement of the chapters with several changes in titles are logical and sound. The initial section and chapter presents some of the new material and serves admirably to orient the reader in the broad relationship of obstetrics to public health, to medicine in general, and to other closely allied fields. The long chapter on the toxemias has been rewritten and includes a new and simple classification of these disorders. An extensive section on hemolytic disease of the newborn by Dr. Milton S. Sacks is authoritative and up-to-date. Other major sections which have been rewritten deal with endocrinology, placental transfer, abortion, ectopic pregnancy, hydatidiform mole and chorionepithelioma, multiple pregnancy, diabetes mellitus, syphilis, pelvimetry, pelvic contractions, uterine inertia, forces concerned in labor, placenta previa, transverse presentation, analgesia and anesthesia, rupture of the uterus, post-partum hemorrhage, puerperal infection, and asphyxia neonatorum.

New illustrations include colored plates of the pelvic floor and an excellent portrayal of the Waters and Norton extra-peritoneal cesarean sections. Several commonly employed terms such as engagement, primigravida, primipara, multipara, toxemia of pregnancy, placenta previa, forceps delivery, and breech delivery which were previously confusing are defined and classified in accordance with an agreement arrived at in conference with these other authors of obstetrical texts. Readers would welcome similar efforts applied to such terms as abortion, immaturity, and prematurity.—*Commander E. B. Hopper, MC, U. S. N.*

**SIMPLIFIED CHEMISTRY EXPERIMENTS**, by Armand Joseph Conzelmann, *Instructor in Biological Chemistry, Hahnemann Medical College, Philadelphia, Pa.; Science Instructor, Hahnemann Hospital School of Nursing, Philadelphia*.

*Pa*; formerly Laboratory Supervisor Human Serum Albumin Department, Sharp & Dohme, Inc., Glendolden, Pa. formerly Analytical Chemist, The Barrett Division, Allied Chemical & Dye Corp., Philadelphia, Pa. Edited by M. Cordelia Cowan, Illustrated by Richard Albany. 234 pages; illustrated. G. P. Putnam's Sons, New York, N. Y., publishers, 1950. Price \$2.80.

These experiments are designed to give the novice many of the fundamental chemical and physical facts of import in inorganic, organic, and physiological chemistry. They are apparently designed for general technician training, as no attempt at specialization is made. To achieve this goal in a single manual designed for a time outlay of 124 hours is a monumental feat. Despite the necessity, therefore, of concentration on fundamentals only, the experiments proceed in an orderly and rapid progression, and are well integrated. Given competent supervision, the student should profit by the visual and mental stimuli occasioned by the outlined procedures. Especially noteworthy are the sections which explain (a) the metric system, (b) the arithmetic involved in the preparations of solutions, (c) ionization and electrochemistry, and (d) colloidal solutions and their behavior.

Certain clinical laboratory tests on blood, urine, and milk are included.

—Lt L. J. Rodenas, *MSC U S N*

**WATER AND SALT DEPLETION** by H. L. Marriott, C. B. E., M. D., F. R. C. P., *Uddlesley Hospital, London, England*. Publication Number 32, American Lecture Series. 80 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.

This monograph presents a series of Croomin Lectures delivered before the Royal College of Physicians, London, in December 1946. Revisions have brought the material up to date. Because of their close association in metabolic processes, water and salt depletions are regarded by some writers as always occurring simultaneously, and as a result many patients have been subjected to physiologically unsound treatment. The author does not fall into this error but places water and salt depletions in three distinct categories: (a) pure water depletion, (b) pure salt depletion, and (c) mixed water and salt depletion. By the use of charts and tables, a vast amount of information is clearly and concisely presented. The author, being a physician, rather than a physiologist, presents the data from the clinical standpoint giving the diagnosis, causes, effects, treatments, and prevention of water and salt depletions. A bibliography containing 126 references is included.

—Lt E. F. Burgess, Jr., *MSC U S N*

**THE PHYSIOLOGY OF TISSUES AND ORGANS: An Introduction to the Study of Systematic Physiology**, by Douglas H. K. Lee, M. D., M. Sc., D. T. M. F. R. A. C. P., *Professor of Physiological Climatology, The Johns Hopkins University, Baltimore, Md.; formerly Professor of Physiology, University of Queensland, Australia*. 170 pages, illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$4.

Compiled from carefully edited lecture notes for an undergraduate course, this scanty epitome of systematic physiology is reminiscent of the "College Outline Series" dear to the hearts of undergraduates at examination time. The limited scope and superficial treatment of the physiology of tissues and organs presented in this volume make it of doubtful use even as a review outline. As a textbook it is without merit. The blood is discussed in 3 pages and the lungs in three-quarters of a page. The chapter on the embryo considered as an organ seems singularly out of context. Only one reference is given, and that appears in the

chapter on the aging of tissues. This chapter is inserted apparently as a philosophic afterthought, with little bearing on what has gone before as the concluding chapter of part I devoted to the physiology of tissues. The illustrations are few but good; the typography is excellent.

—*Lt. Comdr. S. W. Handford MSC, U. S. N.*

**THE DIAGNOSIS OF SALMONELLA TYPES**, by F. Kauffmann, M. D., *Chief International Salmonella Center, State Serum Institute, Copenhagen, Denmark*. Publication Number 62, American Lecture Series, 86 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.25.

This handbook discusses the theory and methods followed in the serologic and biochemical classification of the organisms in the salmonella group. Clearness of concept is sacrificed to some degree by the brevity of the text, but adequate material is included to make the reader aware of the complexity of the subject. The diagnosis of all salmonella types is a special problem which can only be dealt with effectively by salmonella typing centers, and the average bacteriologic laboratory should be concerned with only a few of the more important types.

—*Lt. Comdr. W. W. Taylor, Jr., MSC, U. S. N.*

**MANUAL OF RHEUMATIC DISEASES**, by W. Paul Holbrook, M. D., and Donald F. Hill, M. D., *Tucson, Ariz.*, with the assistance of Charles A. L. Stephens, Jr., M. D. 182 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$4.25.

This manual presents a lucid description of the more common rheumatic diseases. The illustrations have been well selected. Because the rarer rheumatic diseases are not described and there is no documentation, much of the value is lost for those who desire to pursue their case studies further. The aspects of preventive therapy are well presented and properly stressed. Until such time as rheumatic diseases can be prevented every effort must be made to apply proper and adequate preventive therapy to avoid the crippling deformities. This manual will be of most value to the general practitioner and the medical student.

—*Lt. Col. I. H. Marshall, MC, U. S. A.*

**PYE'S SURGICAL HANDICRAFT, A Manual of Surgical Manipulations, Minor Surgery, and Other Matters Connected With the Work of Surgical Dressers, House Surgeons and Practitioners**, edited by Hamilton Bailey, F. R. C. S. Eng., *Surgeon, and Surgeon-in-charge of the Genito-urinary Department, Royal Northern Hospital, London; Senior Surgeon, St. Vincent's Clinic and the Italian Hospital; Surgeon, Consolation Hospital, Lambeth; General Surgeon, Metropolitan Ear, Nose, and Throat Hospital, London; Consulting Surgeon, County Hospital, Chatham, Potter's Bar Hospital, and Clifton Hospital; formerly External Examiner in Surgery, University of Bristol*. 16th edition, fully revised. 724 pages with 830 illustrations. The Williams & Wilkins Co., Baltimore, Md., publishers, 1950. Price \$6.

This new edition of a surgical manual written principally for interns, residents, and general practitioners, covers a wide range of subjects each of which is deserving of a separate monograph. Chapters on such widely divergent topics as first aid, pre- and post-operative care, anesthesia, clinical laboratory methods, treatment of venereal disease, fractures and dislocations, and the minor surgical technique of all the surgical specialties, force the authors to be brief to the point of omitting even the highlights of their chosen subjects. An example of this sketchy organization is the 4-page chapter on the management of thyroid cases by the editor, in which Lugol's solution, thiouracil, and vitamin B in the early



preoperative treatment of the patient are mentioned, but propylthiouracil, methalthiouracil, and radioactive iodine are omitted. The only antibiotic recommended for various surgical infections is penicillin. This may stem from the unavailability of streptomycin, aureomycin, and other antibiotics in Great Britain. The authors have presented an incredible number of minor surgical methods and diagnostic procedures, which should be of great assistance to medical students and interns. Surgeons who have advanced beyond the intern level will find the treatment of any particular subject much too brief and lacking in the more recent advances to be of practical value.

—Commander P. C. Gutzetta, Jr., MC, U. S. N.

**CONGENITAL ANOMALIES OF THE HEART AND GREAT VESSELS**, by THOMAS J. DRY, M. D., et al from the Mayo Clinic and the Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota. Edited by Paul R. Cannon, M. D., Professor of Pathology, University of Chicago School of Medicine, Chicago, Ill. A monograph in American Lectures in Pathology. 69 pages; 80 illustrative plates of models in color, photographs and drawings. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$4.50.

This excellent concise and descriptive book is the outgrowth of the fine exhibit prepared by the authors for the centennial meeting of the American Medical Association held in 1947. The authors have portrayed by photographs of models, specimens, and drawings the structure of congenital heart anomalies. The more common clinical features of each anomaly are listed. Portraits of pioneer investigators in the field of congenital heart disease have also been included with short biographic notes.

—Commander J. A. Grindell, MC, U. S. N.

**KINESIOLOGY** by Laurence E. Morehouse, Ph. D., Associate Professor of Physical Education, The University of Southern California, Interim Chief Performance Physiology Section, United States Air Force School of Aviation Medicine; and Formerly Research Fellow, Harvard Fatigue Laboratory and John M. Cooper, Ed. D., Associate Professor of Physical Education The University of Southern California; Formerly Associate Director of Physical Training, Army Air Forces Training Command; and Formerly Athletic Coach, University of Missouri. 433 pages, illustrated. The C. V. Mosby Co., St. Louis, Mo., publishers, 1950. Price \$4.50.

This book was written mainly for students of athletics and physical education. The first half deals with the growth, development, and structure of the organs of locomotion and discusses the physiologic and mechanical features of their function. The second half is devoted to an analysis of the function of the locomotor system in each element of athletic activity under such headings as running, lifting, hanging, throwing, and swimming. Specific information, presumably of invaluable aid to athletic coaches, is given concerning the varied suitability of different body types for different purposes and how a person's strength may be increased by teaching him to use the synergistic action of related muscles. This book unfortunately loses much of its authority through the presence of numerous typographic errors and confused terminology.

—Col. M. S. Thompson, MC, U. S. A.

**MANAGEMENT OF PERIPHERAL ARTERIAL DISEASES**, by Saul S. Samuels, A. M., M. D., Chief of the Department of Arterial Diseases, Sturevant Polyclinic Hospital, New York; Consulting Vascular Surgeon, Long Beach Hospital, Long Beach, N. Y.; Director and Attending Angiologist, Brooklyn Hebrew Home and Hospital for Aged, Brooklyn, N. Y.; Fellow in Surgery, New York

*Academy of Medicine; Member of Committee on Surgery, New York Diabetes Association; Editor-in-Chief, "Angiology"; President, Angiology Research Foundation. 345 pages; illustrated. Revised and enlarged from The Diagnosis and Treatment of Diseases of the Peripheral Arteries. Oxford University Press, New York, N. Y., publishers 1950. Price \$7.50.*

This is the third book on this subject by the author and is the result of his personal experiences with thousands of cases in 25 years. About half of the book is devoted to thromboanglitis obliterans and half of the remainder discusses arterio-sclerosis obliterans. The history, etiology, pathology, signs and symptoms, treatment, complications, and differential diagnosis are thoroughly and adequately covered. The author is an ardent advocate of the use of hypertonic saline solution in the treatment of occlusive vascular diseases but not many clinicians share his enthusiasm, nor will many men, particularly surgeons, agree with him in assigning a minor role to lumbar sympathectomy. His strong plea for conservative surgery in the management of gangrene in Buerger's disease should be heeded by all in view of the fact that it was necessary to perform only 4 major amputations in over 1,000 of his cases. The space devoted to illustrative case reports seems excessive.

The other disorders of the peripheral arteries are briefly, and in some instances only superficially, discussed. One glaring error appears on page 290. In discussing the causes of peripheral arterial embolism it is stated "over-enthusiasm in the use of *digitalis* to bring auricular fibrillation to normal cardiac rhythm has been a frequent cause of the detachment of emboli from the left auricle." The next sentence concerning the wisdom of converting auricular fibrillation to a sinus rhythm is open to debate. This volume does not add very much to the already voluminous literature on peripheral vascular diseases.

—Col F. M. Goyette, MC, U. S. A.

TRANSACTIONS OF THE AMERICAN GOITER ASSOCIATION, 1949 Annual Session, May 26, 27, 28, Hotel Lorraine, Madison, Wis. 460 pages; illustrated. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$10.50.

To anyone interested in diseases of the thyroid gland, including pathogenesis, diagnosis, and the newer forms of therapy, this volume is a welcome and valuable addition. In the investigative work reported, the research on exophthalmos and fat mobilization is the most thought provoking. There are also several interesting papers on antithyroid and thyroid hormonelike preparations. The place of radioactive iodine in diagnosis and therapy is discussed thoroughly. Of special interest is the round table conference on the present treatment of hyperthyroidism. Advocates of surgery, antithyroid drugs and radioactive iodine report their opinions. A symposium on carcinoma of the thyroid and its relationship to nodular goiter covers the subject so completely that no doubt is left in the mind of the reader as to the significance of nodules in the thyroid. There are also several case reports and papers on miscellaneous phases of diagnosis and pathology of diseases of the thyroid. Each paper is followed by a bibliography. There is no index but the volume is preceded by a list of contents. The paper and printing are of a quality that makes reading easy.

—Commander E. P. McLarney, MC, U. S. N.

EXHIBITIONISM, by N. K. Rickles, B. S., M. D., Fellow of the American Psychiatric Association, Diplomate of the American Board of Psychiatry and Neurology, Senior Consultant at the Veterans' Administration Center, Los Angeles, Consultant in Psychiatry to the Office of the Surgeon General, Medical Department, United States Army, and Director of the Psychiatric

procedures involved in making the science of endodontia a practical and worthwhile health measure. It helps to eliminate from our minds that carelessness and vagueness which has crept into this phase of dental science and has allowed our medical conferees to question whether what we do is in the best interests of the patient. The author first describes in detail the etiology and pathology of the various disturbances of the pulp and peridental structures and the diagnostic tests to help determine the nature of the disturbance. The indications and techniques involved for pulp capping and pulpotomy are carefully considered. This is followed by a discussion on the technic of treating and filling the pulpless tooth. Much credit is due to the author for his insistence on absolute sterility and the use of the rubber dam in these procedures. Canals are not to be filled until negative cultures are obtained.

The role played by and the use of antibiotics singly and in combinations (especially the penicillin, bacitracin, streptomycin, and caprylate sodium mixture) are evaluated and they represent a step forward in control of refractory root canal infections. The final chapter on indications for root canal work in children is invaluable because it emphasizes the importance of making all efforts to prevent the untimely loss of deciduous teeth. The technic for pulpotomy and root canal treatment is presented with the understanding that this work be attempted only in selected and cooperative patients. The dentist who arbitrarily prefers exodontia to attempts at conservation of members of the natural arch will do well to give thought to the principles set forth in this book.

—Capt M. Dickert, U. S. A. F. (DC)

**BRAIN AND BEHAVIOUR: Induction as a Fundamental Mechanism of Neuropsychic Activity.** An Experimental and Clinical Study with Consideration of Educational, Mental-Hygiene and General Sociological Implications by N. E. Ischlonidsky, M. D. 182 pages. Illustrated. C. V. Mosby Co., St. Louis, Mo., publishers, 1949. Price \$7.

The author has engaged in the investigation of a fundamental mechanism of neuropsychic activity induction for 10 years. Induction is defined as the mechanism by which every manifestation leads, under certain well-defined conditions, to the appearance of an opposite process. Thus a focus of excitation produced in the brain and spinal cord, under appropriate conditions, gives rise to a focus of inhibition—negative induction. The reverse process is also true. The initial portions of the book are concerned with an explanation and analysis of the author's original experiments. These experimental techniques are classified under six headings, including conditioned reflex experiments, the investigation of the sensory threshold, and others. From these investigations, the author concludes that induction is an independent nervous mechanism, operation at all levels of the nervous system. The conditions necessary for every manifestation of induction are: (1) functional antagonism between involved nervous centers, (2) certain intensity of the primary nervous process, (3) sporadic not gradual changes in the intensity of this process, and (4) inconsistency in its establishment.

The concept of induction is seemingly adequate, and at least plausible to explain the experimental observations cited in the book, but when its use is generalized to explain, in part at least, emotional reactions, intellectual processes and psychopathic behavior, it is questionable. Ischlonidsky criticizes the psychologists, particularly the analyst, for a purely subjective speculative psychology analysis of human behavior. In the last few pages of the monograph he appears to be open to a similar criticism. However, the author proposes a

new perspective in explaining emotions and behavior, which should be of interest to all psychiatrists and psychologists, regardless of orientation

—*Capt J. J. Kavanagh, U. S. A. F. (MC)*

**HARVEY CUSHING**, Surgeon, Author, Artist, by Elizabeth H. Thomson. Foreword by John F. Fulton. 347 pages; illustrated. Henry Schuman, Inc., New York, N. Y., publisher, 1950. Price \$4.

This is a very entertaining and instructive book. It gives one an intimate glimpse of Dr. Cushing's early life and throws light on incidents which molded his character. Much more is made of Mrs. Cushing's influence than in other biographies which have appeared. Previous biographers have emphasized Dr. Cushing's greatness and pioneer spirit. This book, while not minimizing his greatness, brings out his humanness. It clearly records that he was a driver and one who would not forgive a mistake or tolerate anything from his juniors except perfection. Dr. William Osler had great influence on Dr. Cushing and his death was keenly felt by Dr. Cushing. The early days of the Johns Hopkins Medical School are described and the great impression that school made on Dr. Cushing is discussed at length. Dr. Cushing had many calls to fill various professorships but was reluctant to leave Johns Hopkins or Harvard for a position where he could not live and work in academic freedom. This book should be an inspiration to young physicians.

—*Col D. M. Walker, MC, U. S. A.*

**LIPPINCOTT'S QUICK REFERENCE BOOK FOR NURSES**, by Helen Young, R. N., Director of Nursing, Emeritus, Columbia Presbyterian Medical Center; Editorial Board, Department of Nursing, Faculty of Medicine, Columbia University, Presbyterian Hospital School of Nursing, New York; Mary Elizabeth Allanach, A. M., R. N., Assistant Professor of Nursing; Elizabeth S. Gill, B. S., R. N., Instructor in Nursing; Eleanor Lee, A. B., R. N., Assistant Professor of Nursing; G. Harriet Mantel, A. M., R. N., Instructor in Nursing; Helen F. Pettit, B. S., R. N., Assistant Professor of Nursing. 6th edition. 626 pages. J. B. Lippincott Co., Philadelphia, Pa., publishers, 1950. Price \$3.

This comprehensive review of the essentials of nursing practice includes (1) general information; (2) materia medica; (3) nursing techniques; (4) dietotherapy; (5) medical and surgical nursing; and (6) obstetric nursing. The information included is not detailed, but the material is carefully selected. The material under each topic is arranged alphabetically and is easily found. Condensed tables in the sections on diet therapy, common contagious diseases, and poisons and treatments are very helpful. Although discussion of psychiatric disorders and of principles of psychiatric nursing is omitted, the section on nursing techniques includes procedures for the application of restraints and for a sedative pack. Under medical and surgical nursing, such topics as alcoholism, convulsions, epilepsy, and vascular diseases of the brain are included. This book should prove helpful to nurses at foreign duty stations or at smaller stations where reference books are limited. It could be recommended to experienced hospital corpsmen who are on independent duty as a most useful adjunct to the Hospital Corps Manual.

—*Lt. C. Maas, NC, U. S. N.*

**OFFICE TREATMENT OF THE NOSE, THROAT, AND EAR**, by Abraham R. Hollender, M. Sc., M. D., F. A. C. S., Professor of Otolaryngology, Emeritus, University of Illinois College of Medicine; Attending Otolaryngologist, St. Francis Hospital and Mt. Sinai Hospital, Miami Beach; Consulting Otolaryngologist, Variety Children's Hospital, Miami, Fla. 3d edition. 620 pages; illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$7.50.

The author stresses the importance and the details of the office management of the many conditions of the ear, nose, and throat which can be adequately treated in the office with some simple supplemental home measures. This edition deletes some material formerly included and presents new developments in otolaryngology. Nutrition, physical medicine, and psychosomatic problems have been given increased consideration. Established principles and procedures are described. The text is essentially sound, even though the advisability of a few of the procedures recommended such as (a) the local use of sulfonamides in acute empyema of the maxillary sinus, and (b) the irradiation of the nasopharynx for a nonmalignant condition may be questioned by some. More information might be desired on the problems of the patient who must select a hearing aid. On the whole it is well organized, well written, and will be a valuable addition to the library of the otolaryngologist or the general practitioner.

—Col H S Murphey, MC, U S A

**HANDBOOK OF OBSTETRICS AND DIAGNOSTIC GYNECOLOGY**, by Leo Doyle, M S M D  
Illustrations by Ralph Sweet. 240 pages illustrated. University Medical Publishers, Palo Alto, Calif., publishers, 1950. Price \$2.

The author of this compendium has included some very practical illustrations and charts. He has thoroughly reviewed the literature and has brought the material up to date. He discusses the emotional aspects of pregnancy and presents a practical approach to the minor symptoms of pregnancy which are of special interest to the general practitioner. The chapter on alleviation of pain in labor outlines all the modern concepts except for hypnosis and the more indefinite methods expressed by Read in "Childbirth Without Fear." The chapter on delivery in the home should interest the general practitioner. Practically all of the major aspects of obstetrics are covered and references are given to current pertinent papers of interest. The role of the Rh factor and emergency procedures in obstetrics are covered. The section on diagnostic gynecologic entities deals mainly with classification and the practical solution of those problems without entering into the controversial aspects of the particular subject. Laboratory data and an obstetrical calendar are printed on the inside covers.

—Maj H L Rita MC, U S A

**THE PHYSIOLOGICAL BASIS FOR OXYGEN THERAPY**, by Julius H. Comroe, Jr., Professor of Physiology and Pharmacology, Graduate School of Medicine, University of Pennsylvania; Clinical Physiologist, Hospital of the University of Pennsylvania; and Robert D. Dripps, Professor of Anesthesiology, University of Pennsylvania School of Medicine. Director of Anesthesiology, Hospital of the University of Pennsylvania. Publication Number 42, American Lecture Series. 85 pages. Charles C. Thomas, Publisher, Springfield, Ill., 1950. Price \$2.

This excellent monograph emphasizes the rational physiologic basis for oxygen therapy. It does not describe any techniques, but states clearly the rationale of the use of oxygen in modern therapeutics. Various theories are discussed and the reader is allowed to draw his own conclusions regarding them. Although this monograph does not present anything new it affords an able condensation of the available material on the subject under discussion. It should prove of great value to nurses or physicians who treat patients with oxygen and indispensable to students in medicine and residents of anesthesiology.

—Maj D E MacQuigg, MC, U S A

**CEREBRAL ANGIOGRAPHY**, by P. Almeida Lima, Professor of Neurology, Lisbon Faculty of Medicine; Head of the Neurosurgical Department, Hospital Julio De Matos, Lisbon, with an introduction by Egas Moniz, formerly

*Professor of Neurology, Lisbon Faculty of Medicine No. 1 P. 100*  
Foreword by Sir Hugh Cairns, K. B. E., D. M., F. R. C. S. *Neurology*  
*of Surgery in the University of Oxford.* 221 pages. Illustrated. Oxford  
University Press, New York, N. Y., publishers, 1950. Price \$8.75.

This outstanding monograph covers the subject of cerebral angiography thoroughly and skillfully. It is well written, understandable, and has a good number of illustrations. The history of cerebral angiography is reviewed briefly and the technic used by the author is described in detail. It is unfortunate that the chapter dealing with technic, written in 1946, has not been brought up to date because, as pointed out in a footnote, numerous improvements have been made since that time. The author recommends the use of thorocontrast and transtaneous injection, whereas diodrast permits percutaneous injection and is more popular at present. The normal arteriogram is shown both schematically and by photographic reproduction with several variations. Successive chapters deal with the use of the arteriograms to localize tumors, ventricular dilatation, and diagnosis of intracranial tumors. Here again the illustrations are an excellent supplement to the text. In fact, the 181 diagrams and illustrations suggest the use of this book as an atlas. This is probably the best book in its field and one which many clinicians will find of great value.

—Col. E. R. Inceod, MC, U. S. A.

**ESSENTIALS OF MEDICINE, The Basis of Nursing Care**, by Charles Phillips Emerson, Jr., A. B., M. D., *Associate Professor of Medicine, Boston University School of Medicine; Member, Robert Dawson Evans Memorial Laboratory; Visiting Physician and Physician in Charge of Clinical Laboratories, Massachusetts Memorial Hospitals; Attending Physician, Cushing Veterans' Administration Hospital and Medical Consultant, American Red Cross; and Jane Elizabeth Taylor, R. N., B. S., M. Ed., Lecturer, Frances Payne Bolton School of Nursing, Western Reserve University; formerly Nursing Education Consultant, U. S. Public Health Service; formerly Assistant Professor of Medical Nursing, Yale University School of Nursing, and Assistant in Charge of Medical Nursing, New Haven Hospital.* 16th edition, revised and reset. 815 pages; 191 illustrations, including 5 subjects in full color. J. B. Lippincott Company, Philadelphia, Pa., publishers, 1950. Price \$4.

This book deals with every field of medicine including the specialties. It is divided into 12 units, each dealing with a body system. The orientation sections preceding each unit give the aims and scope of the unit. Clinical situations at the end of each unit help the reader to grasp concepts of the total care of the patient and treatment of the patient as a person. The principles discussed in this book are phases of nursing related to prevention, recognition, and treatment of varied diseases. In this latest edition scientific and sociologic principles related to medical nursing have been correlated. This is an excellent book for use as a text for nurses. Although the authors have used lay terminology suitable for instructing students, the content is excellent as a reference for graduate nurses as well. The illustrations are meaningful. The 2-column page facilitates reading, and helpful references are given at the end of each unit.

—Lt. E. Pulckinus, NC, U. S. N.

**UROLOGIC ROENTGENOLOGY**, by Milley B. Wesson, M. D., *Past President American Urological Association.* 3d edition. 282 pages; illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$7.50.

The new edition of this popular and authoritative work is fully up to date. The text has been revised thoroughly and all important new developments in

urography added. Perirenal insufflation and laminography are two of the newer diagnostic methods described in the chapter on technics of urography. Pararenal ganglioneuroma, thrombosis of the renal vein, Paget's disease, and osteitis pubis are among the new headings in this edition. Sixty new illustrations have been added and the text has been enlarged by 23 pages. Many old plates have been discarded and new, more representative ones added.

As in the two preceding editions, the quality of the paper and the clarity of the reproduced roentgenograms are particularly praiseworthy. The plates have been chosen with care so that the roentgenologic findings are typical of the disease entities and may be readily demonstrated by the accompanying, concise descriptions. Especially remarkable are the brief case histories which are printed beside many of the representative roentgenograms. The text is not too technical for the newcomer to the subject of urography and at all times the emphasis is placed on clinical diagnosis, confirmed by roentgenographic and laboratory studies and proved by operative or postmortem findings.

The index has been thoroughly revised and brought up to date. Many new headings have been added and others have been reclassified in the interest of accuracy. Particularly noteworthy are the references, found at the end of each chapter. As stated by the author in the preface to the second edition (1946), his "aim is not to supply a treatise, but to provide a *cade mecum*." In this purpose, he has succeeded admirably. This text is invaluable to both the urologist and the roentgenologist. It is particularly valuable in the teaching of residents in both specialties.

—Capt S. Johnson, MC 1 S N

**ORAL AND FACIAL CANCER**, by Bernard G. Sarnat, M. D., F. A. C. S., *Professor and Head of the Department of Oral and Maxillofacial Surgery, College of Dentistry, and Clinical Assistant Professor of Surgery, College of Medicine and Research and Educational Hospital, University of Illinois, Chicago, Diplomat of the American Board of Plastic Surgery, and Isaac Schorr, D. D. S., Ph. D., Sc. D., Coordinator of Cancer Instruction, Professor and Head of the Department of Histology and Associate Dean in Charge of Postgraduate Studies, University of Illinois College of Dentistry, Chicago, with a foreword by Andrew C. Ivy, Ph. D., M. D., D. Sc., Vice-President in Charge of Chicago Professional Colleges, University of Illinois, Executive Director of The National Advisory Cancer Council. 300 pages. Illustrated. The Year Book Publishers, Inc., Chicago, Ill., publishers, 1950. Price \$6.*

This well-written book, although somewhat elementary, is highly recommended to the general practitioner, both medical and dental, as a guide in the early diagnosis and treatment of oral and facial cancer and to the student for use as a text. It is divided into three parts; the first dealing with the public health aspects of the cancer problem and the present status of cancer research; the second with the clinical aspects of oral and facial cancer; and the third with the control of oral and facial cancer. As an adjunct to the text proper an appendix with a quick reference list of do's and don'ts, danger signals, and other data, is included. An excellent description of the normal for comparison with the deviations from the normal in the structures involved is presented. The illustrations are excellent. The questions for students at the end of each part of the book are well chosen and will aid the understanding of the material presented. An excellent bibliography is appended.

—Col. A. E. Toye, DC, U. S. A

**CORONARY CIRCULATION IN HEALTH AND DISEASE**, by Donald E. Gregg, M. S., Ph. D., M. D., *Chief Research Physician, Medical Department, Field Research Laboratory, Fort Knox, Ky. 227 pages, illustrated. Lea & Febiger, Philadelphia, Pa., publishers, 1950. Price \$4.50.*

This book consists of 8 chapters, each with an excellent bibliography. The author begins with a concise statement of the present-day problem of coronary disease and a short discussion of the burden placed on the medical profession in the treatment and prevention of heart disease. He then proceeds with a detailed but easy to read summary of the anatomy of coronary circulation. After acquainting the reader with past and present methods of experimental study, the author goes on with a discussion and an evaluation of the various measurements which have been made on the coronary blood flow, including its characteristics and distribution. Following this he evaluates the various known determinants of flow and the effects of the commonly used drugs on the coronary circulation. A chapter is devoted to the metabolism of the heart muscle. The final chapter is given to the coronary circulation in heart disease and failure with special emphasis on atherosclerosis of the coronary arteries and its effect on the coronary circulation.

Although much of the material in this book comes from the investigative work of Gregg and his associates, he carefully evaluates the work of other investigators and discusses controversial issues. The mass of detailed description of experimental procedures may not appeal to some clinicians, but in a period when rapid progress is being made in research in heart disease, this briefing as to the nature, reliability, limitations, and pitfalls of the methods used in coronary arterial research should be welcomed. Now that technical methods to study the coronary circulation *in situ* are available, the effects of various drugs on the circulation should soon be forthcoming. The clinician should understand the hemodynamics of the coronary circulation and be familiar with the methods used in investigative studies if he expects to evaluate the results of future studies.

This book comes at a time when the physicians engaged in clinical and preventive medicine and research are becoming increasingly aware of the importance of heart disease. It behooves the physician, regardless of his special interest, to become apprised of the current advances in knowledge of the coronary circulation and for the clinician who devotes his time to the treatment and prevention of heart disease to learn all he can about it. The Army Medical Service should feel justly proud of fostering this pioneer work in the study of the coronary circulation which will become the background for research in the prevention of the most important of the chronic degenerative diseases.

—Col. T. W. Mattingly, MC, U. S. A.

POST-GRADUATE LECTURES ON ORTHOPEDIC DIAGNOSIS AND INDICATIONS, Vol. I, by Arthur Steindler, M. D., F. A. C. S., *Professor of Orthopedic Surgery, State University of Iowa, Iowa City, Iowa*. 280 pages; illustrated. Charles C Thomas, Publisher, Springfield, Ill., 1950. Price \$7.50.

This first volume of postgraduate lectures on orthopedic diagnosis and indications by Steindler is divided into two parts: propedeutics in orthopedic diagnosis, and congenital deformities and disabilities. The first section consists of lectures on the symmetry and asymmetry of the body; contractures; the interpretation of pain in orthopedic surgery; and abnormal gaits. These complicated mechanical discussions of basic orthopedics require prolonged study for understanding. The second section consists of lectures on deformities of the extremities, spine, and thorax. Deformities caused by disturbances of bone growth are discussed from the standpoint of pathology, treatment, and so forth. This section is beautifully illustrated by photographs and roentgenogram reproductions. One lecture each is devoted to congenital talipes and to congenital dislocation of the hip. The author corrects clubfoot by use of the Denis Browne splint, wedged plaster casts, and corrective casts, using the Brockmann operation for resistant



and recurrent changes. He makes no mention of transfer of the anterior tibial tendon for recurrent cases. The lecture on congenital dislocation of the hip must be commended for its clarity and completeness.

—*Lt Comdr A. B. Dickson, MC, U. S. N.*

**TECHNIQUES IN BRITISH SURGERY**, edited by Rodney Maingot, F R C S 733 pages, illustrated W. B. Saunders Co., Philadelphia, Pa., publisher, 1970 Price \$15

At first glance the reader might think that this is merely another atlas of technical operative procedures, but is rewarded by discovering a much more comprehensive though concise coverage of surgical disorders. The material is organized into four main parts corresponding to regional anatomy, (1) head, neck, and spinal column, (2) thorax; (3) abdomen and pelvis; and (4) extremities. Within each of these anatomic domains the various pathologic entities in general and specialized fields are discussed in characteristic polished literary style. In addition to operative technique the chapters include brief historic notes, pathologic anatomy and physiology pre- and post-operative management, and results obtained by the methods discussed. One thus gets a well-rounded view of each condition. The chapters on congenital cardiac defects, thyroid disorders, tuberculous lesions, peptic ulcer, "synchronous combined resection" for rectal carcinoma, bone grafts, and the management of senile and diabetic gangrene are especially good. On the other hand, for the American reader, too much emphasis has been placed on vagotomy, thoracoplasty, and the management of thoracic empyema. The material is clear and well presented. The book is of value as a basic text and gives a good insight into current British thought.

—*Lt F W Meyer, Jr, MC, U. S. N.*

# Index to United States Armed Forces Medical Journal

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